DECEMBER, 1956

B 625437

PIPE LINE INDUSTRY

Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

FASTER CONSTRUCTION

Know-How Pays Off on 36-Inch Work

p. 10

BETTER OPERATIONS

How to Get More From Tank Mixers

. . p. 17

QUICKER COATING

New Barge Speeds Weight Coating

. . . p. 20

IMPROVED DESIGN

Tougher Pipe Steels on the Way

. . . p. 24

LOWER COSTS

Submarine Plow Buries Marsh Lines

p. 30

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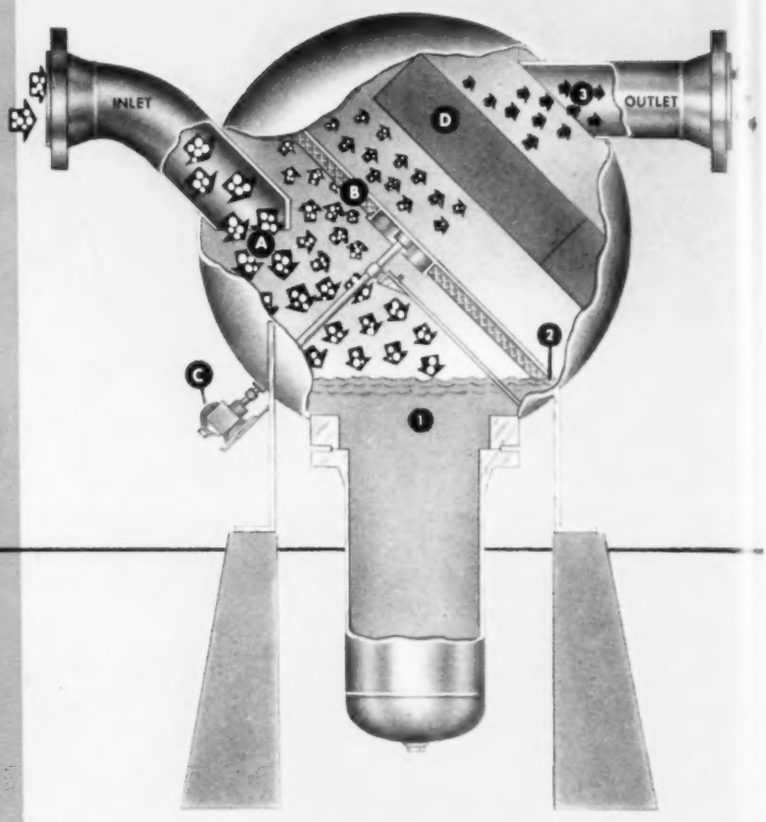
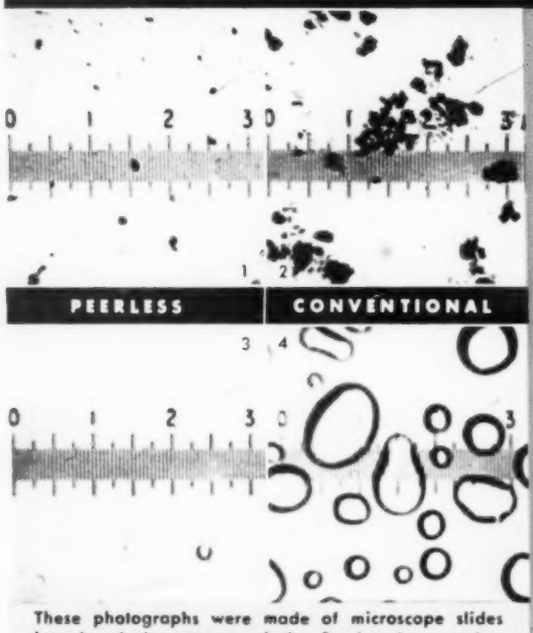


(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving through liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

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PIPE LINE INDUSTRY

CONTENTS and Quick Look

December, 1956 Vol. 5, No. 6

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Know-How Paying Off in Laying 36-Inch Loops

☐ Contractors on Transcontinental's $55 Million looping project are putting to good use all of the lessons learned in two years of experience with the big pipe. Pipe is being coated over the ditch and lowered-in in one operation. Alcohol wash following hydrostatic tests is reducing dew-points to normal or below. . Page 10

How to Get the Most From Tank Mixers

☐ New variable position mixer designs combine the duties of keeping tank bottoms clean, providing efficient blending, and aiding in the removal of water. Here are some of the key points of design, installation, and operating procedures.

L. R. Van Arsdale . . . . . Page 17

New Barge Takes Weight-Coating to Sea

☐ Heavy asphalt-mastic coating is applied aboard 'seagoing' plant during construction of Southern Natural Gas Company's new 12-inch lateral near Lafitte, La. The coating is applied continuously, and pipe is lowered astern of the laying barge. Material promises good physical properties plus high corrosion resistance.

Ralph C. Hughes, Jr. . . . . Page 20

Tougher Steels in the Mill for Future Pipe Lines

☐ What plans are in the mill for new line pipe steels? What are their advantages over present steels? Answers to these and many other questions regarding steels of the future are presented by one of the nation's top metallurgists. Here is a timely analysis of research in new steels, including preheat conditions, progress reports, properties and welding characteristics and other subjects of major dollars and cents importance to every pipeliner.

A. B. Wilder . . . . . Page 24

Giant Plow Lays Marsh Lines in a Hurry

☐ This article presents a new way to meet the problems caused by laying exposed lines on the bottom of salt water bays. This new method of ditching, and lowering-in, reduces cost of burying these lines. South Louisiana pipeliners with Humble Oil & Refining Company designed this "king-sized" middlebuster to open the ditch for small diameter bay and marsh lines. Laying 3,000 feet of 4-inch gas line three feet below a mud bottom took only two days. . . . . Page 30

Perk Up Your Employe Communications

☐ No business can operate in a communications vacuum—particularly a growing pipe line company. Here is a timely analysis of the vital role communications plays in employe relations, plus a detailed discussion of good and bad communications approaches. Be sure to check the four basic fallacies in modern employe communications.

Dr. Alan A. McLean . . . . . Page 33

☐ **If Oil Could Speak** it would have many fascinating truths to tell the non-oil public—truths that would win thousands of new friends for the oil industry. BUT, oil can't speak—you can. You, as an individual can win many new friends for the oil industry if you will pass the true facts on to your oil industry friends. This article—the first of a series—appears on **Page 32** for one purpose: To equip you with as many facts as possible about your industry, so you can tell the story oil is unable to relate. Be sure to read **If Oil Could Speak.** You will find it informative—and interesting.

Management's "Forgotten" Men

☐ Here is a timely discussion of the pipe line industry's executive manpower problem. The author presents a thought-provoking analysis of: (1) The growing trend toward management development programs. (2) Sources of executive talent (middle men of management). He also outlines several excellent pointers for the development of executives.

Joseph M. Trickett . . . . . Page 36

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Healthy Industry Imperative

If World War II didn't teach the American government and people the value of having a strong domestic oil industry, then events which have been occurring in the Middle East recently should bring the lesson strongly before us.

It is not enough that the oil companies, American and others, having properties in the Middle East should have the good will of the Arabic nations. We think that the oil companies have so conducted themselves as to earn the respect and good will of the nations in which they produce oil.

We do not believe that any Middle East government having oil or through which oil lines traverse, had a part in the sabotage of the oil pipe lines.

But when an irresponsible, malicious upstart like Dictator Nasser, who disregarded a treaty respected by his government for 90 years, can successfully urge the destruction of the oil lines *in other countries*, oil supplies for Western Europe come in for sober study. Dependence of Western Europe on Middle East pipe lines and the Suez Canal in times of war are cause for real concern in the U. S. and all other peoples of the Free World.

•

No, we are not proposing that the Middle East be ruled out of participation—even in American affairs. Nor are we suggesting that imports of oil into the U. S. be stopped. Anybody who would suggest that is not thinking straight. The U. S. needs oil imports, but we also need to have a sound, healthy oil industry in these United States. The United States of America furnished a great part of the oil with which World War II was won. And, as this is written in early November, it is not unreasonable to expect she may be called upon to help supply Western Europe with necessary oil.

We believe that the imports of recent months have been excessive. Whether the ratio of imports to U. S. crude oil production (with certain exceptions relating to Venezuela and residual fuel) imposed by the Office of Defense Mobilization some time ago should have been 16 or some other percent we can now determine probably better than was the case at the time it was made. We do not presume to say just how much can be imported without damaging the health of the domestic oil industry.

The figure of imports having a relation to 16 percent of domestic production was determined at a previous conference but it has not been enforced. It was done in the nature of a gentleman's agreement and we are not saying that somebody present forgot to be a gentleman! Or even that more than one forgot!

•

But the subject is so important that the very best brains of the industry—no firebrands on either side—should be called together by our government to work toward a solution to this problem. There *must* be some figure at which imports can be brought in without damage to the domestic industry. And it should be enforced. Such a meeting should convene in the serious consideration that a healthy domestic oil industry is imperative to the safety of not only our country, but her allies.

Ray L. Dudley

Bottom-to-Top Opportunities

YOUNG MEN of integrity, initiative, loyalty and education, who have cast their lot with the oil industry, can get a real thrill from two pages of the Mid-Year issue of *The Texaco Star!* Most people in the oil business know that the industry awards its competent men but *The Texaco Star* told of:

• The retirement of a chairman of the board who had gone to work for The Texas Company as a lube salesman.

• The elevation to the chairmanship of the board of a man who during the depression went to work for the company as a service station supervisor, and

• The promotion to the presidency of a man who went to work for the company as a rotary rig helper.

True, these men had good educations but they went to work at the bottom and their loyalty to company interests, their native competence and their energy put them to the top without wealth—or pull.

The man retiring is chairman J. Sayles Leach, who received an award from the Texas Mid-Continent Oil & Gas Association as a man who had made real contribution to the industry. The new chairman is Augustus C. Long, and the new president who succeeded Long in that position is James W. Foley.

Power to them all as living examples of the way a free democracy, with free enterprise, works!

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For a big, tough clearing job– the biggest, toughest tractor –the D9

This CAT* D9 Tractor is clearing a 50-foot right-of-way through the rugged Blue Mountains of Oregon for Pacific Northwest's 22-inch natural gas line.

To pioneer in the frozen rock, clay and snow, Fulghum Contracting Corp., LaGrande, Ore., used the biggest of the big yellow machines. It has done everything asked of it. Reports Jerry Muldowney of Fulghum, which has 45 other Caterpillar-built units on the job:

"It's doing a very impressive job, particularly on the many side cuts and steep grades. We work it in second gear in rock and third everywhere else."

And here's important news about the D9 for pipeliners. Now you'll get even more production from this giant. *Its Turbocharged engine output has been increased to 320 HP at the flywheel!*

Here's one way to figure the production you get from a D9 equipped with a big No. 9A Bulldozer. On a 50-foot haul, this unit can handle 610 loose cubic yards per hour. This figure can be increased as much as 75% in downhill 'dozing and trenching!

This is a unit that can produce no matter where the pipe takes you. It is equipped with oil clutch or torque converter drive. Steering clutches and air-cooled steering brakes are power boosted. It has a heavy-duty 7-roller track frame and long-lived specially hardened track shoes. It's built for high production no matter what the climate or terrain.

Have your nearby Caterpillar Dealer show you the new D9 soon. He'll demonstrate its work capacity right on your job. Call him today.

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3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

Terrain dictates some mighty peculiar contours. As an oil or a gas man, you're well aware of this. But, are you also aware of the secret of bendability of line pipe? It's simply the right combination of physical and chemical properties. Youngstown Electric Weld line pipe manufactured from uniform high quality steel, is capable of producing even smooth bends to fit any contour with uniform roundness. You know the importance of this—you know what this means on any job.

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PIPE LINE PANORAMA

Will Europe Get Its Oil? . . . U. S. and Venezuelan producers say yes—more than enough is available to meet Europe's needs. However, transportation problem leaves situation dangling in uncertainty.

Problem 1: Getting enough tankers to carry Western Hemisphere crude to meet Europe's urgent demand for at least 500,000 barrels a day—possibly up to 800,000 barrels a day. No immediate answer unless a large number of tankers are pulled in from Middle East.

Problem 2: Getting enough crude to Gulf Coast ports to keep tankers busy. Another knotty knob buster with no immediate answer. Railroad crude hauling rates are too costly. Tank trucks are in short supply. Pipe lines are—and have been—operating at capacity for past four weeks supplying domestic demands and tanker shipments to Europe.

Here are highlights of transportation developments: Pipe line industry is shuffling and juggling to make as much capacity as possible available. Alternatives include:

1. Add more pumps to pipe lines with capacity to handle more crude. (For example, from West Texas to the Gulf, El Rancho alone could up capacity 200,000 bpd with added booster stations.)
2. Temporarily convert products lines to crude carriers.
3. Reroute West Texas crude through Middle West pipe lines to St. Louis, then ship by barge to New Orleans and, via Intracoastal Waterway, to Galveston, Port Arthur and Houston.
4. Utilize crude sources near deep water ports to take some of the load off pipe lines.

First two alternatives will be adopted only in dire emergency. Predicted six months to one year duration of Middle East crisis tends to put these possibilities out of range of economic feasibility.

Alternative 3 is now in operation. This potential is slowed down by shortage of barges and expense.

Alternative 4 is also in operation, but on very moderate scale. Louisiana (with most of its crude sources near deep water ports) and Texas have both upped allowables for November and December, though far short of Europe's demands.

El Paso to Become Biggest Supplier in U. S. . . . Pending stockholder approval, El Paso Natural-Pacific Northwest merger shapes up as one of the biggest business transactions in pipe line history. If merger goes through, El Paso will have:

Main lines (in operation and under construction) totaling more than 8500 miles. Capacity will be upped to 3.2 billion cubic feet per day.

One of the largest reserves of natural gas in the U. S.

Combined assets totaling about $1.1 billion, making El Paso largest natural gas supplier in the U. S. (See Page 44.)

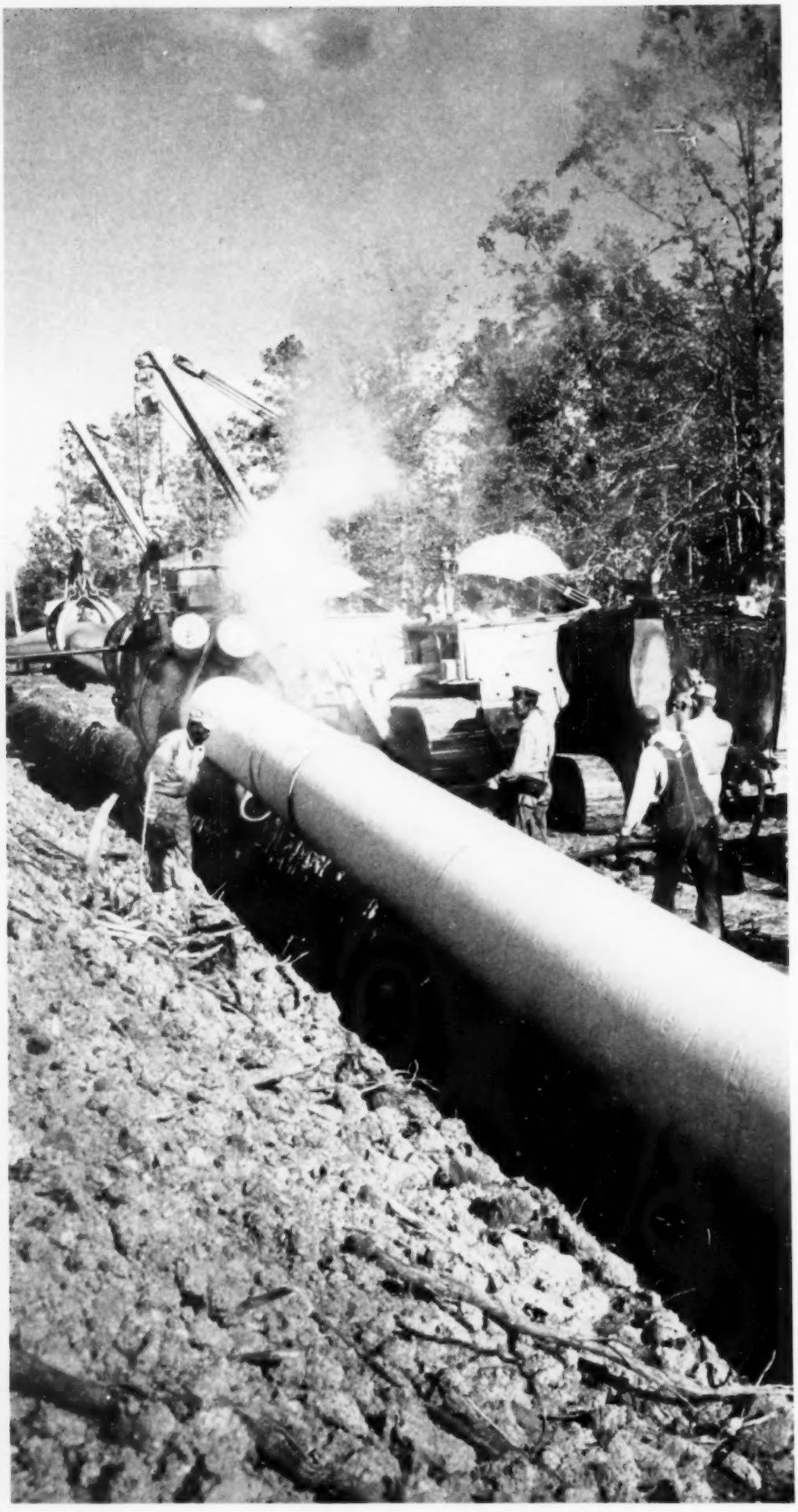


FIGURE 1—In the rolling country near Selma, Ala., Sharman, Allen, Gay and Taylor's spread coats and lowers-in 36-inch pipe in one operation. In this kind of terrain, three tractors could cradle the pipe handily, enabling the spread to make about a mile per day. New light-weight transistorized "jeep" proved very successful in inspection of the coating.

Know-How

EACH YEAR'S new experience wit laying 36-inch pipe on Transcont nental Gas Pipe Line Corporation line loops adds more answers to th book on pipe line construction. Sew pipe methods were used on the fir 36-inch jobs laid two years ago. La year several contractors adopted con ventional methods putting the pip on skids and lowering in later. Thi year they are cradling, coating and lowering-in the ditch in one opera tion; handling the big pipe as though it were a lot smaller than the 0.406 wall 155 pounds per foot heavy weight it is.

Included in Transco's 1956-57 loop ing program are 211 miles of 36-inch and 117 miles of 30-inch line. This expansion is designed to up Transco's peak day capacity to 831 Mmcf per day. Several new construction ideas are being put into practice with good results on the $55 million job. Lessons they have learned, plus the close co operation between spreadmen and Transco's inspectors made the job a real success.

Most of the heavy 36-inch pipe is being coated internally with epoxy resin coating. The slick inside makes drying easier after hydrostatic testing permitting fewer pig runs to dry the line. Both time and gas are saved. On each loop, pigs are run until there is no evidence of water in each section of line after testing.

All water used for hydrostatic test ing is filtered through excelsior and rag, analine dye type filters. The slick epoxy coating plus filtration prevents sediment and sand particles from entering the line and reduces the pos sibility of damage to controls and compressors after loops are placed in service.

Methyl Alcohol Used to Dry Line. To eliminate any traces of moistu e in the line after testing and piggi g, a slug of methyl alcohol is forc d through the line before it is given li e pack. This drying operation redu s dew points to a level as low as th e

Paying Off in Laying 36-Inch Loops

Contractors on Transco's $55 million looping project are handling the big pipe by small pipe methods—only the equipment and number of welders on the firing line are larger.

observed in normal operations. Dew points of less than 5 pounds of water per Mcf were found after many of the alcohol runs. Enough alcohol is put into the line between the squeegees to provide a one mil thickness on the wall of the pipe when the slug passes through the line section.

Experience Plus Good Equipment Speed Pipe Laying. Valuable lessons learned in up to three years of 36-inch work is speeding up the construction of the big pipe loops. Pneumatic line-up clamps used on the 36-inch pipe for the first time sped up pipe gang work as much as 10 percent. More important than the speed perhaps is the fact that the new clamp cut down on the beating the pipe had to take, to take out highs and lows during line-up. On many of the joints a hammer never even touched the pipe.

Contractors on the joint venture are J. P. Neill and Company and Sharman, Allen, Gay and Taylor. The short lengths of spreads plus the large number of them required a lot of quick movement of men and equipment. At times one spread was working from Louisiana to Alabama on five different loops. About every 12 days spreads moved, keeping six floats and lowboys on the move almost continuously.

FIGURE 2—Pneumatic internal line-up clamps speed work of pipe gang on Transco's 36-inch looping project. Estimates range from eight percent to ten percent more joints made per day.

FIGURE 3—Three welders run stringer beads on 36-inch pipe on spread near Selma, Ala. Good weather permitted fast welding on these loops.

Pictures Continued on Next Page

FIGURE 4—Twenty-one welders worked on the firing line of Sharman, Allen, Gay and Taylor's spread. Welders made an average of about eight welds apiece per day.

FIGURE 5—Cooperation pays on right-of-way Cy Brandau, Transco's landman, Emmett Singleton, Sharman, Allen, Gay and Taylor's spread boss, and Bill Bowersox, chief inspector for Transco, worked closely on right-of-way problems. Cooperation between contractors, Transco and landowners cut right-of-way problems to a minimum. Quick on-the-scene assistance by Transco's landmen made going smoother for the pipeliners.

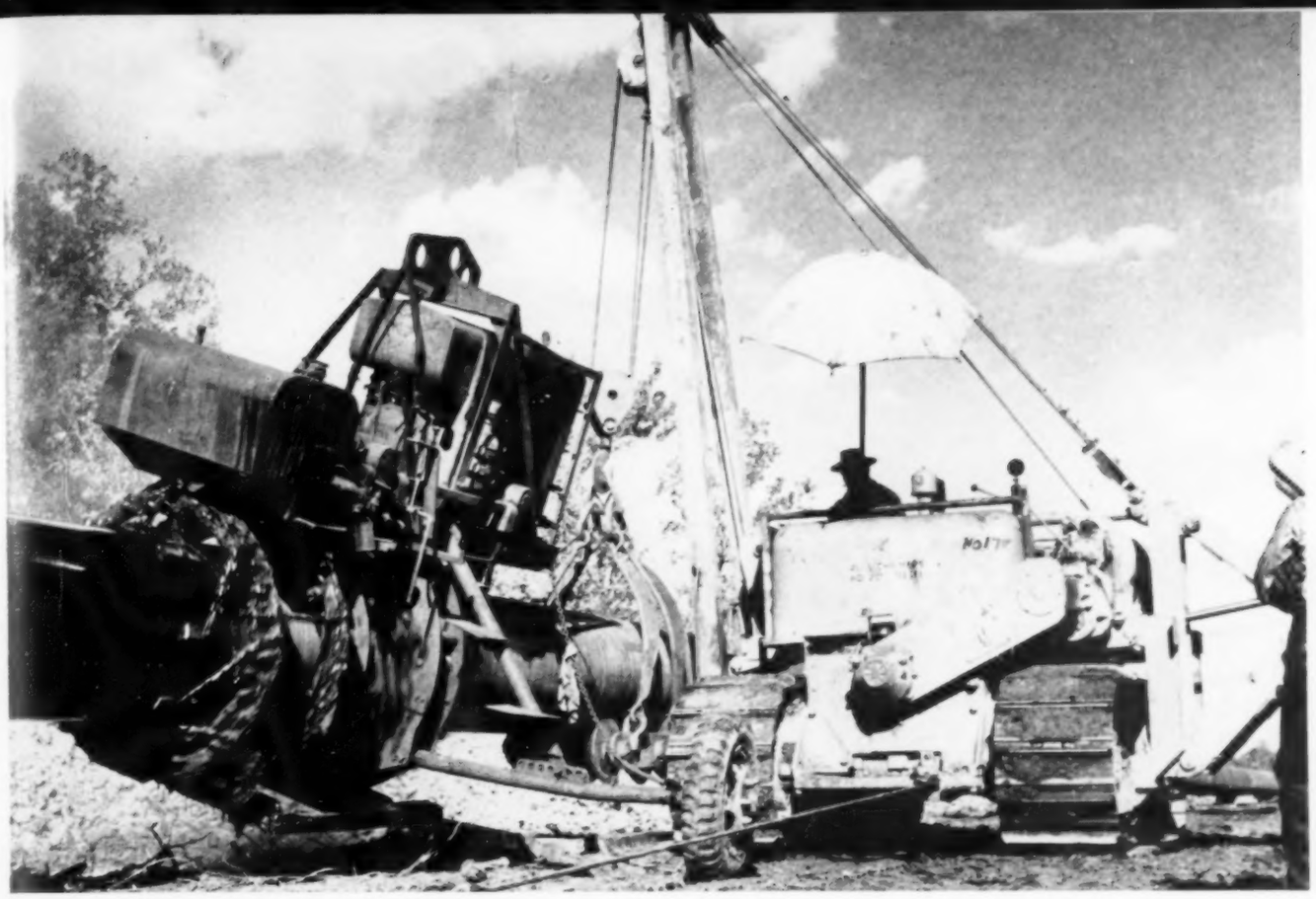


FIGURE 6—Big pipe being cleaned and primed on Transco's loop near Selma, Ala. Most of the 36-inch, 0.406-inch wall pipe had previously been coated internally with epoxy resin and pickled. The pickled surface provided an excellent exterior surface for primer.

FIGURE 7—Following cleaning and priming, pipe was cradled by three side booms while it was coated and wrapped over the ditch and lowered in one tight spread operation. Experience with big pipe is paying off in much of the terrain along Transco's line where it is possible to handle the pipe over the ditch. Only in rugged hill country would contractors expect to handle the pipe on extra time.

Continued on Next Page

FIGURE 8—As 36-inch pipe is cradled over the ditch, it received a coat of ⅛-inch asphalt enamel and a wrap of glass fiber and kraft paper. Up to a mile per day was made coating and wrapping pipe over the ditch and lowering in in one operation.

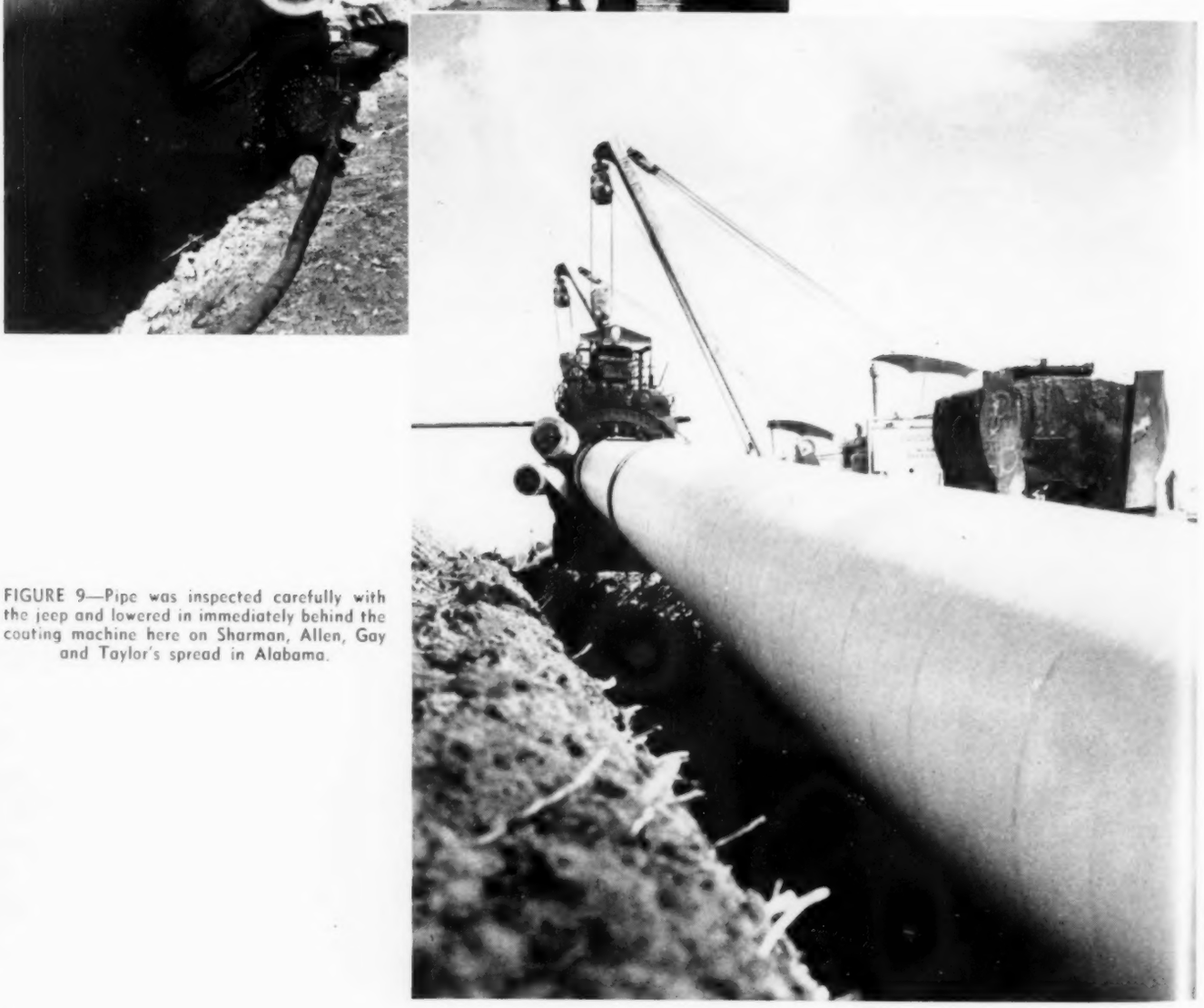
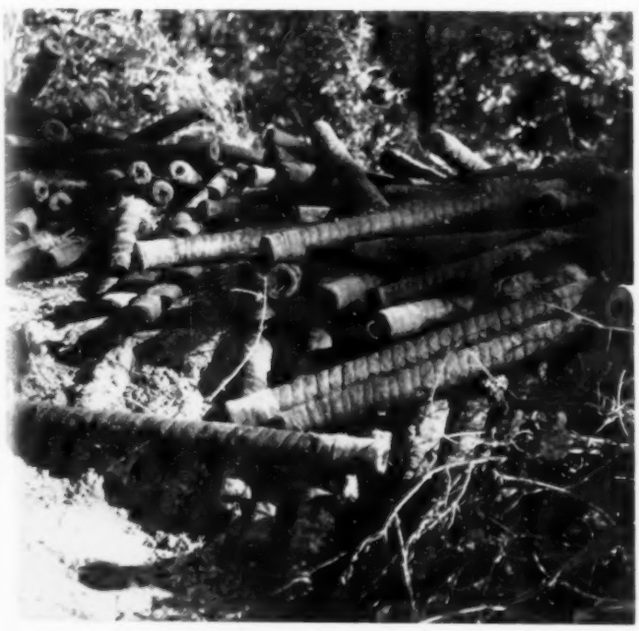


FIGURE 9—Pipe was inspected carefully with the jeep and lowered in immediately behind the coating machine here on Sharman, Allen, Gay and Taylor's spread in Alabama.

Continued on Next Page

FIGURE 10—Bill Gadman, Transco's coating inspector, signals to the side boom operator as 36-inch pipe goes into the ditch. The 48-inch ditch gave tight clearance on either side of the big pipe, but inspectors watched closely to make sure that it was lowered in carefully and that the ditch bottom was smooth.

FIGURE 11—Two filter units clean the river water used to test an 8.6 mile section near Quitman, Miss.



IGURE 12—A set of excelsior-rag type filter elements taken from the ressure filter units after over two million gallons of water had passed hrough them for hydrostatic testing. Efficiency of these type filters has een proven in Transco's looping program by the reduced amount of sediment and sand introduced into the line during testing.

FIGURE 13—Testing line, L. E. Reese, pipe line maintenance department of Transco and Fred Miller with Williams Pressure Testing Service, read the dead weight gage on a section line under test in Mississippi. All loops in this year's construction project were given a hydrostatic test for over 24 hours.

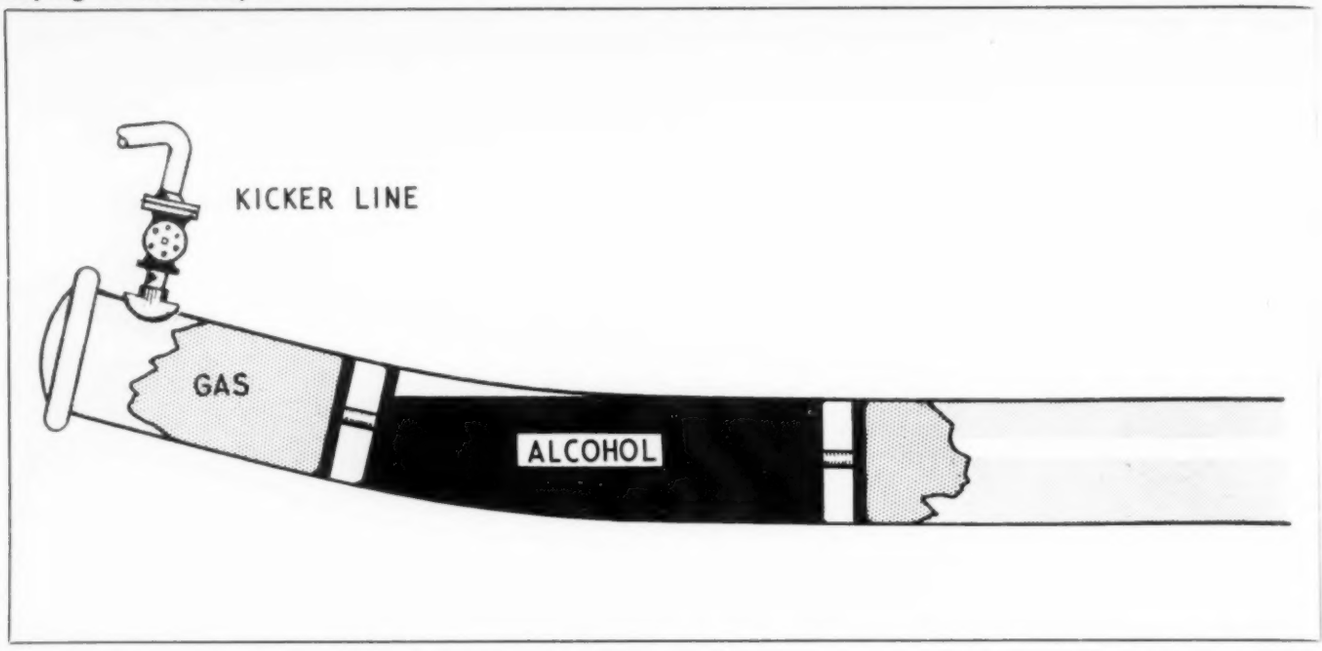


FIGURE 14—Methyl alcohol was forced through the line between pigs as a plug following water removal by pigging. Transco engineers found that the alcohol rinse reduces dew points to normal or below following hydrostatic tests. Volume of alcohol is calculated to provide a one mil film on the pipe wall.

FIGURE 15—Temperature of the line was closely watched during hydrostatic testing. Here G. K. Smith Pipe Line Maintenance department of Transco, checks the temperature recorder after the line had been on test several hours.

FIGURE 16—After hydrostatic tests pigs were run through all loops unt no more water comes from the line. The slick inside of the epoxy coate pipe plus a careful pigging program is cutting down the amount of moi ture present in the gas after testing.

—The En

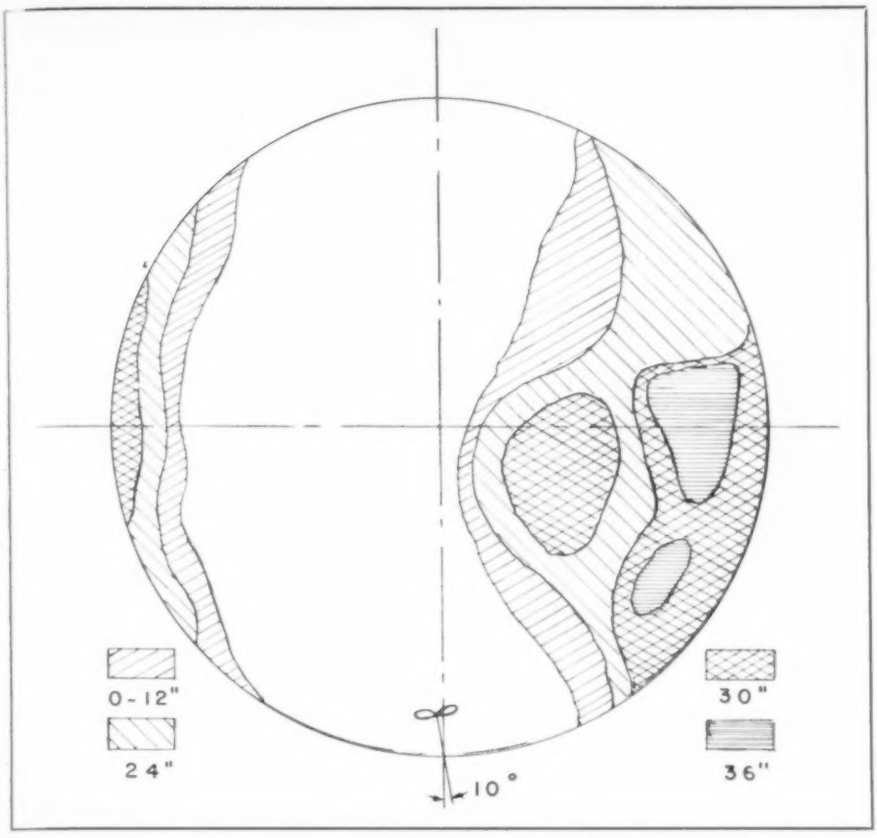


FIGURE 1—Typical contours of tank "bottom" deposits after mixing with fixed angle mixer.

How to Get the Most From Your Tank Mixers

Engineers are improving mixers and the application of them to give better over-all blending and tank cleaning. A variable-angle mixer with proper scheduling offers a solution to "high bottom" problems.

By **L. R. VAN ARSDALE**
Jensen Engineering Company
Tulsa

NEW TANK MOUNTING DESIGNS for mixers allow their angle of entry to be changed in the horizontal plane. This innovation gives the mixer a more complete sweep of the bottom — improving systems already proven economical in sediment and paraffin removal. Careful attention to proper installation and operation will produce best results.

While prevention of depositions may be the primary use of mixers they are also well adapted for in-tank blending of two or more oils of differing gravity and viscosity, at the same time proving beneficial in water removal. With proper usage, all three of these purposes can be accomplished in any single installation.

Deposit Removal Still A Big Problem. "Blending-type" or "fixed-angle" mixers were originally used on crude tanks with very beneficial results. These mixers have a seven or ten degree permanent angle setting directed to give a clock-wise movement of the oil when looking down from above the tank.

In using the fixed angle many instances were found where one side of the tank received very little cleaning while other areas were not sufficiently cleaned next to the tank wall. Figure 1 shows contours of deposits on a tank bottom after considerable mixer operations.

While deposit removal eliminates the necessity of cleaning the tank, other problems are encountered. Connate water causes corrosion on uncoated tank bottoms, water can not be collected for proper withdrawal and water drain connections become plugged.

One method of overcoming this condition has been the installation of a second fixed-angle mixer at a point 22½ to 45 degrees from the first. While this improves cleaning, it was an increased expense and as tanks became larger in diameter, more and more mixers were required.

Experiments were started to determine if a better job could be done by changing the angle of entry of the mixer into the tank to provide a directed flow stream. It was found that changing to the opposed angle provided a like cleaning job on that side of the tank. It was further found that the angularity had to be increased from the commonly used 10 degrees in order to properly clean along the tank walls. Complete cleaning was accomplished.

Stuffing Box Gives Mixer Versatility. Based on these results, mixers have been designed with a stuffing box arrangement in the manway cover whereby the angle of entry may be changed at any time through a total arc of 40 degrees on a horizontal plane.

Further study determined that the normal method of calculating horsepower requirement in blending operations, as a function of volume, is not necessarily true in obtaining good cleaning results. Tank diameter is a major factor and while a fast rule can not be used—due to the many variations in types of crudes—the follow-

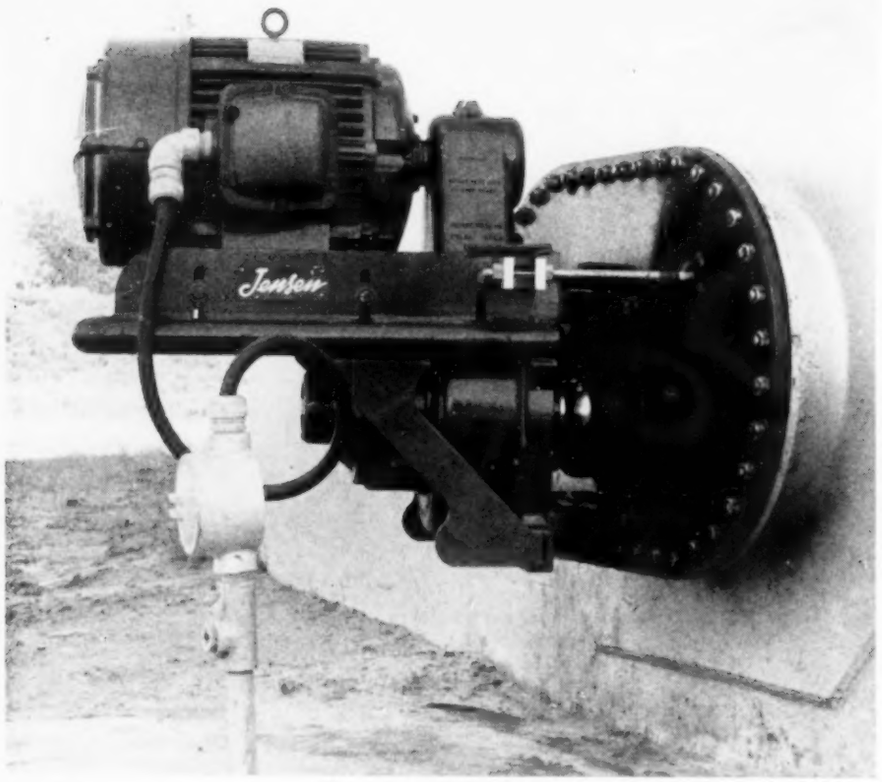


FIGURE 2—Mixer shown here is positioned for cleaning—angle is opposite of that used for blending.

ing schedule is ample in most cases:

Tank Dia.	No. of Mixers & HP	Tank Dia.	No. of Mixers & HP
40'	1-5 hp	90'	1-20 hp
50'	1-7½ hp	100-110'	1-25 hp
60'	1-10 hp	110-150'	2-25 hp
80'	1-15 hp	200'	3-25 hp

Blending Characteristics Improved. In-tank blending of several grades of crudes has been successful where fixed-angle mixers were in use. The variable angle mixer can always be adjusted to the commonly used 10 degree entry angle when blending is desired. Further, it is adjustable to other angles to provide better and faster blending under varying conditions. The entry angle must be changed with changes in tank diameter and other factors such as difference in volume, height of oil in the tank, difference in viscosity and gravity, and number of oils being blended. The correct angle is determined by trial and error for each set of conditions.

Installation Point of Mixer Is Important. Location of variable angle mixer or mixers in the tank is shown in Figure 3, where one, two, or three units may be used. It should be noted that location of the suction line differs from fixed-angle mixers and is placed at a position directly opposite the mixers. A separate fill line would be located as shown. When a common suction and fill line is used and the requirement is for cleaning only the suction line position shown should be used. If blending is needed, the common line should be positioned where fill line is located.

Another possible design when more than one mixer is used for cleaning purposes only is equal spacing of the mixers and the suction line around the periphery of the tank—120 degrees for two mixers and 90 degrees for three.

With good cleaning accomplished, water drain connections may be placed at any point desired.

Mixer Shaft Provides Maximum Clearance for Floating Roofs. Figure 2 shows that the mixer shaft, located in the lower portion of the manway cover plate, provides maximum operating space for floating roofs. A propeller clearance of 12 inches from the bottom of the tank is considered sufficient.

When tank bottoms are coated, a protector or scour plate is recommended on all mixer installations. In using mixers with variable entry angles, the shape of the plate should be similar to the illustration in Figure 4. This plate can be made from two sheets, one 5 feet x 8½ feet cut diagonally and the other 5 feet x 10 feet.

Scour plate supports should be made of angles with three inches clearance between plate and tank bottom. The angles are welded to the bottom, bottom coated or coating repaired, and the plate bolted to the angles. A ¼-inch thickness is sufficient for the plate; it may be sectionalized for entry through existing manways.

A flexible electrical connection is used to permit movement of the mixer in changing positions.

Operation Governed by Stream Samples. Quite often mixers are installed on existing tanks which have accumulated deposits. In these cases the mixers should be run as much as possible so long as the oil level is above six feet. The only limiting consideration is the amount of BS&W the out-going stream carries when the tank is on suction. This can only be determined by testing stream samples and stopping mixer operation

About the Author

L. R. VAN ARSDALE graduated in 1931 from the University of Oklahoma with a BS degree in petroleum engineering and for five years worked with a number of oil companies in the Mid-Continent area. In 1936 he joined Rockwell Manufacturing Co. and in 1949 went to work for Grove Valve and Regulator Co. He joined Jensen Engineering Co. of Tulsa, Okla., in 1955. His experience covers sales, engineering and application of equipment in the pipe line industry.

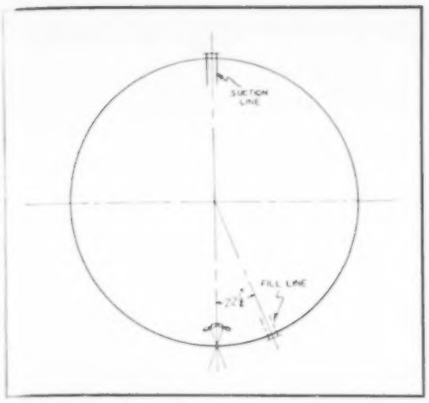


FIGURE 3 (A)—Recommended mixer location, using only one variable-angle mixer.

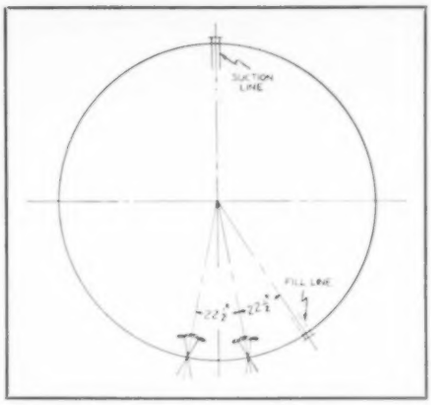


FIGURE 3 (B)—New location requirements when two variable-angle mixers are used.

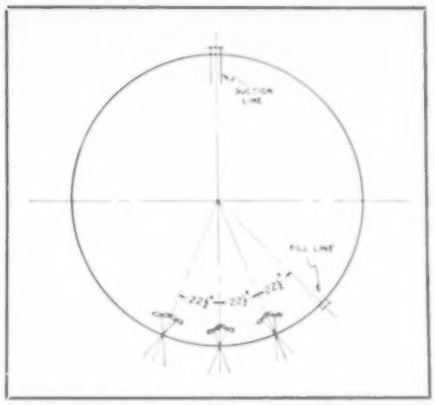


FIGURE 3 (C)—Use of three mixers gives this suggested spacing.

before the maximum allowable is reached.

It is suggested the angularity settings be at each limit with equal length of running time. Change from one position to the other need not be more often than for each filling and emptying of the tank. As cleaning progresses, intermediate settings may be needed, and this is best determined by observation. When more than one mixer is used, angularity settings should be the same on all mixers.

When cleaning has been accomplished, and prevention of further deposits is the only requirement, mixers need only be run when the tank is on suction; and then only intermittently. An operating schedule set up as follows should be ample—in many instances it can be reduced further:

Height of Oil, feet	Mixer on, Hours	Mixer off, Hours
50 - 30	1½	1½
30 - 20	1	2
20 - 12	½	2
12 - 6	¼	1

Angularity changes will have to be made from time to time and this is determined by trial on each installation.

Intermittent operation provides good dispersion of the sediment with savings in power consumption and most important—reduction in agitation and resulting evaporation. A properly adjusted timer can be used for automatic operation.

Mixers Blend Best While Tank Is Being Filled. When blending as well as prevention of deposits is needed, best blending is accomplished by mixer operation while the tank is being filled. This procedure has been outlined previously and may be briefly summed up as follows:

1. Mixers need not be started until the oil level reaches a height of 20 feet.

2. Mixing should continue until top, middle, and bottom samples indicate the proper blending; previous data provides a time schedule; or until movement occurs at the top of the tank.

3. It should be remembered that when it is necessary to gage shortly after blending, a gage well extending to the bottom of the tank should be provided, and the mixers shut down at least two hours before gaging.

When mixers have been operated for blending during the filling period or after having been filled, the schedule for resuspending deposits may be further reduced during the time the tank is on suction.

Needless to say, a clean tank bottom provides for better disposal of water. Further assistance in removal of water is given by the mixer if the blending procedure is in use. Many crudes carry fine globules of water and considerable separation from the sediment and coalescence occurs during agitation. This provides for better settling and it is quite helpful if long settling periods are available after blending. For this reason it is often advisable to operate the mixer intermittently during filling to accomplish water removal, although blending is not necessary.

With good design, proper installation, and correct operating procedure; mixers eliminate the necessity of cleaning tanks, provide well blended oil for refining and are helpful in removal of water.

REFERENCES

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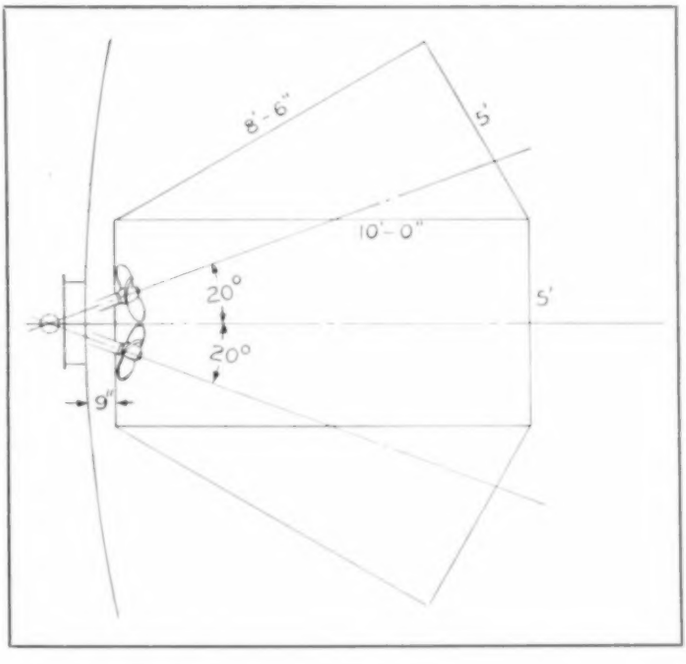

FIGURE 4—Recommended design of "scour plate" to be used under each mixer. Size shown here will give ample protection to tank bottom.

FIGURE 1—Dry-mix station, shown moored to a dock near Lafitte, La., receives bulk dry materials and mixes them in design proportions. This station, being completely barge-mounted, can be readily moved from one sheltered location to another along the line as the job progresses.

New Barge Takes Weight-Coating to Sea

On Southern Natural's new South Louisiana lateral, pipe gets a weight-protective coating with asphalt-mastic in a specially built, barge-mounted plant. First operating kinks are being ironed out. Production reaches 100 joints per day.

By RALPH C. HUGHES, JR.
PIPE LINE INDUSTRY Staff

SUBMARINE PIPE LINES of the future may be given a quick, "one-course," application of a combination weight-and-protective coating—applied continuously aboard the lay barge, in an on-line operation. Initial field application of the heavy asphalt-mastic coating material, introduced last year (See PIPE LINE INDUSTRY, Dec., 1955, Page 20), was made on Southern Natural Gas Company's 12-inch pipe line near Lafitte, Louisiana, at the rate of approximately 100 joints a day. Brown and Root, Inc., of Houston, contractor on the job, designed and outfitted the barge in cooperation with General P. H. Timothy, developer of the coating.

Dry-Mix Prepared Aboard Dockside Barge. The first phase of the coating operation is mixing of all dry materials used, aboard a specially built barge. A speed-controlled bel

onveyor moves beneath large hop-ers, which drop a controlled amount f ingredients onto the belt. The uantity dropped, coupled with the elt speed, allows close control of the roportions of various materials used. The conveyor dumps into a mixer, hich thoroughly mixes the dry ma-rials before passing them on. Dry-ix materials consist of:

- Aggregate—barite or limestone
- Filler—barite, limestone or sand
- Powdered asphalt
- Powdered synthetic rubber

Filler is used to take up the voids in the aggregate, and the asphalt-rubber mixture binds all of the dry materials together. Heaviest mixtures are obtained with barite aggregate and barite filler; light mixtures by substituting limestone aggregate and sand filler. For example, on 12-inch pipe, a 1⅛-inch coating may vary in density from 170-208 pounds per cubic foot by varying the selection of aggregate and filler used.

FIGURE 2—Mixing hoppers at the base station contain the materials to be used in the current mix. The finished dry-mix is conveyed by belts to the waiting shuttle-barges.

Completed dry-mix is transported to the coating barge by shuttle-run hopper barges, keeping the coating machine supplied with ample base stock.

Hot Emulsified Asphalt and Fiber Glass Added on Lay Barge. After the dry-mix is transferred aboard the lay barge, a virtually automatic conveyor and control system takes over

FIGURE 3—Shuttle-barge takes the completed dry-mix from the base station to the coating barge on the job. A team of these can keep the coating barge supplied for continuous operation.

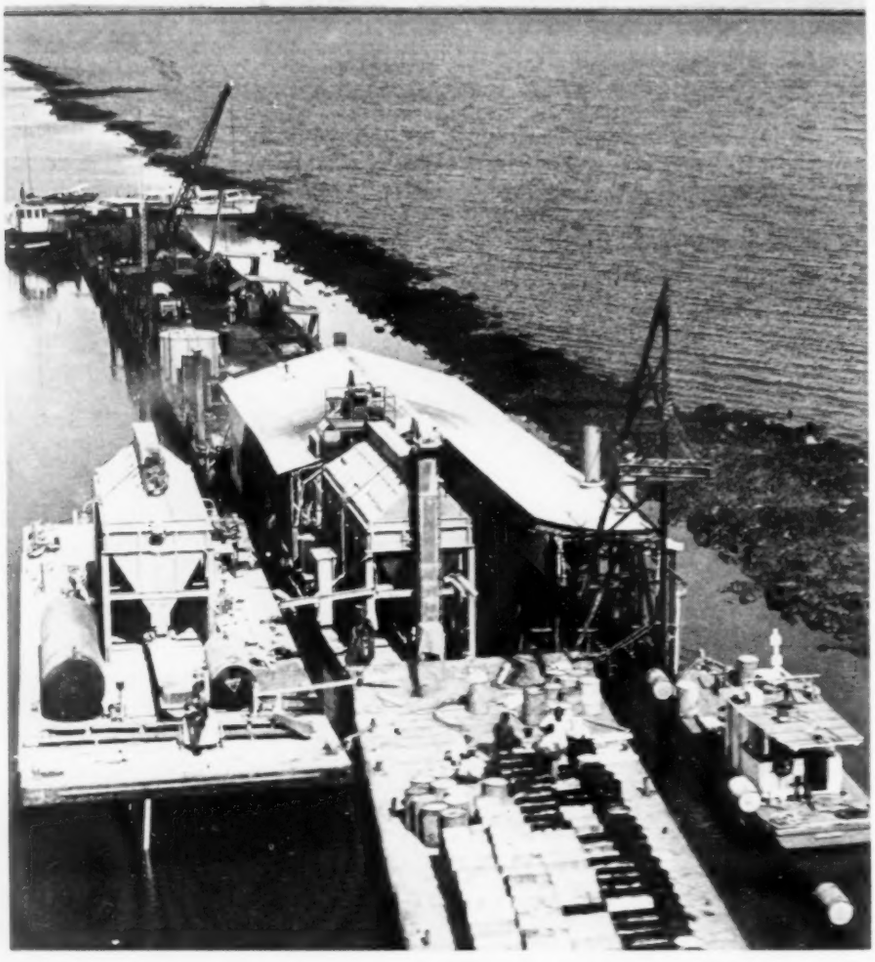

FIGURE 4—Laying, coating and lowering-in are all contained in one compact operation. A shuttle-barge is tied up to discharge its load of dry-mix while a supply barge loaded with "dope" keeps sufficient asphalt available to charge the hot-mix machine.

to handle materials. Hot emulsified asphalt is added, amalgamating the asphalt-mastic mixture, and bring the material up to application temperature (approximately 260° F.). Shredded fiber glass is introduced just before application, to give added strength to the coating. The completed mix is extruded, through the swage-shaped head, onto the pipe—extrusion pressure being supplied by two screw-type feeder pumps.

Elimination of Primer, Plus Vibration Cuts Application Time. During development aboard the barge, two major time-savers have been introduced:

- Elimination of primer coat—rubber and asphalt mix giving the mixture bonding characteristics comparable to most standard primers used.
- Five seconds of vibration, within the extrusion machine, compacts the mixture to near-maximum density. This eliminates any need for compacting devices, allowing the pipe to be cooled by a water spray so it may be lowered-in directly behind the coating machine.

Only 17 Men in Coating Crew. The entire coating operation is performed with a crew of 17 men—9 men on the coating barge, plus 8 men to operate the dry-mix station. Future plans call for separating the laying and coating operations by a span of 2000 feet or more. This change promises to reduce waiting time (either coating waiting on welding or vice versa), and increase production above 100 joints a day.

Coating Promises Several Advantages. Developers expect several big advantages for the asphalt-mastic coating:

- Coating flexibility will allow it to conform to any normal bend the pipe is required to take in meeting contours of the ditch.
- Pipe may be lowered directly from coating-barge with no time consuming curing, or cradling.
- Early tests indicate high resistance to marine life.
- High electrical resistance—measured resistance on a 3600 foot

FIGURE 5—The pipe is conveyed on rollers through the pre-heater in preparing the pipe to receive the hot-mix application. This heater brings the pipe to approximately 110° F before entering the extrusion machine.

test section, after eight months submersion was 540,000 ohms per square foot. A resistance of around 40,000 ohms per square foot is considered an acceptable coating on a dry land pipe line job.

Some Disadvantages May Be Overcome Early. At present, the main disadvantage is the lack of versatility of the extrusion-head opening. Any change in pipe size, or coating thickness, calls for a change to a new sized head. Plans for a multiple-size, or adjustable head will reduce downtime considerably, when changes in design size, or thickness, occur frequently along the route.

Field tie-ins and sharp field bends are now being coated by using a mold —vibrating and heating the outside of the mold, much in the same manner a field joint is made with concrete coated pipe. A tie-in barge carries a small pug-mill mixer with heater, vibrator, and acetylene torches enabling it to operate separately from the main coating barge.

A gunite-type spray application, to coat tie-ins, field joints and excessive bends, is being considered for the future. —**The End**

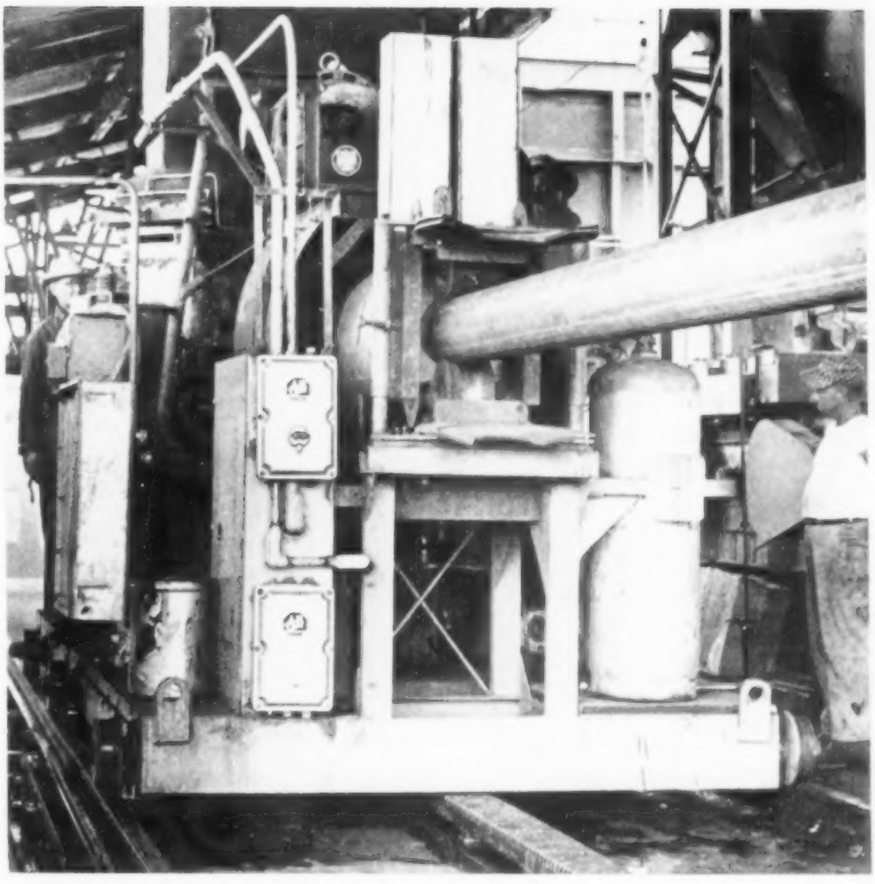

FIGURE 6—Coating machine crawls along track shown in lower-center. View shows pipe entering the knife-type rotary cleaner, which is mounted just in front of the coating machine.

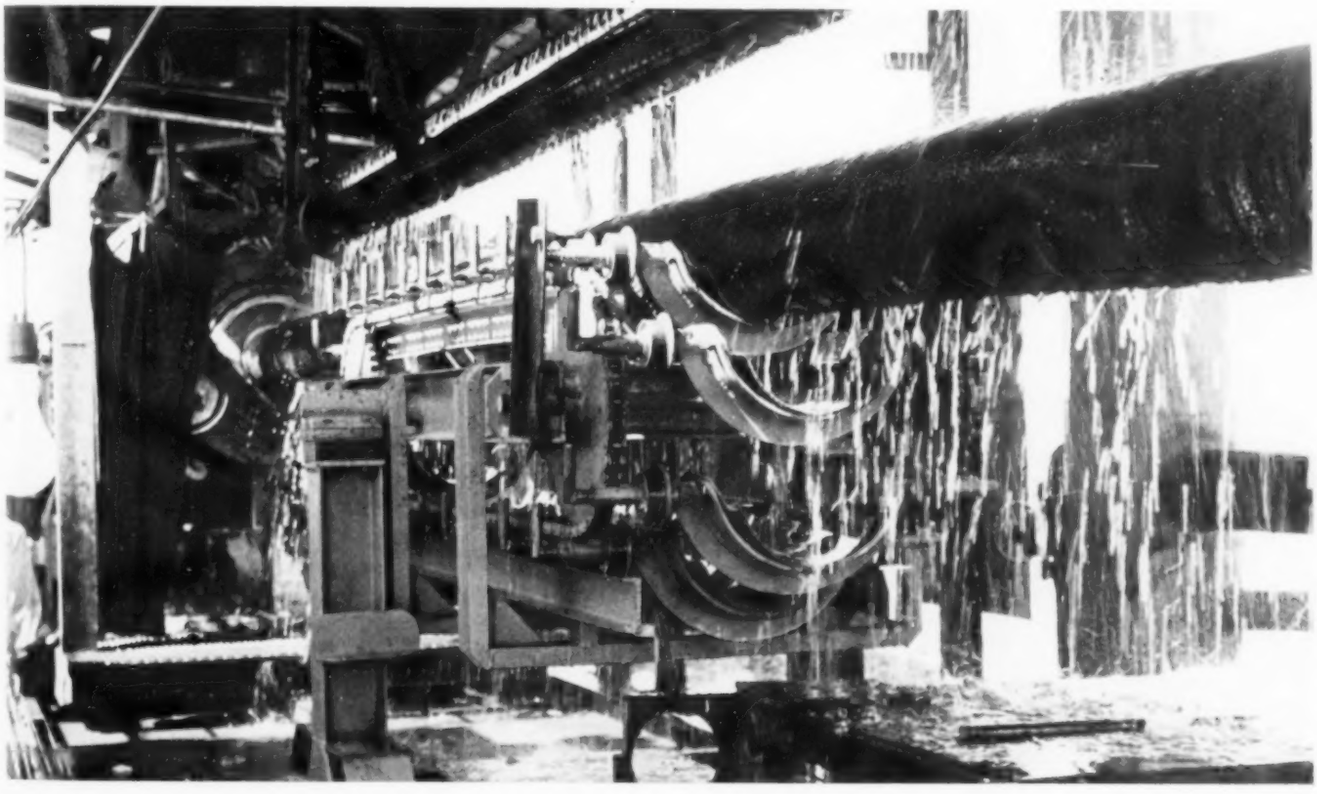

FIGURE 7—The pipe is moved to the back of the barge by combination belt-roller conveyors. During the time needed to cover the distance, water spray cools and cures the asphalt-mastic coating. By the time the pipe enters the marsh, the coating has set up to the extent that there is no deformation caused by the weight of the pipe on the bottom of the ditch. A final wrap of fiber-glass is applied to the hot mix as it leaves the coating machine, adding to its strength and resistance to shock.

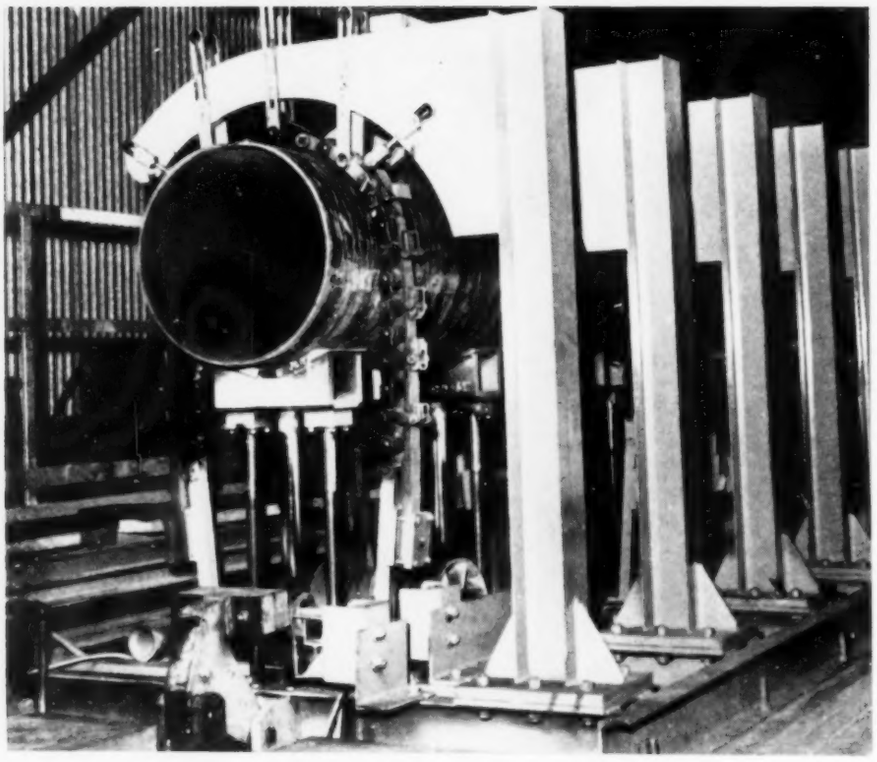

FIGURE 1—Tack welding jig for submerged arc-welded line pipe. After forming, the pipe or "can" is placed in this jig and manually tack welded with bare electrodes in an inert gas atmosphere. Tabs are attached to each end of the can in the tack welding operation.

Tougher Steels in Mill For Future Pipe Lines

One of the top technicians in pipe manufacture reports on:

- **Importance of proof testing gas pipe lines in the field.**
- **Conditions for preheat in the field of API grade X52 line pipe.**
- **Progress with special steels of superior toughness for pipe lines.**
- **Properties and welding characteristics of new line pipe steels with 110,000 psi minimum yield strength.**
- **New manufacturing processes for double submerged arc-welded line pipe and large diameter seamless pipe with an evaluation of yield strength.**

By A. B. WILDER
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THE RAPIDLY expanding network of cross-country oil and gas transmission lines has created a record demand for large quantities of steel pipe. In turn, this growing demand has produced many new developments in the manufacture of line pipe, new and improved materials, plus new applications.

The results of these steel improvements are obvious when you consider the relatively small number of failures in the countless thousands of miles of line pipe now in service. However, if they do occur, gas pipe line failures are much more significant than oil pipe line failures because of the larger amount of stored energy in line pack.

Why Fewer Failures? Reasons for the decidedly smaller number of pipe line failures are fourfold: More careful inspections are being made—proper testing—greater use of seamless pipe in special applications—and close adherence to API specifications.

During construction of a gas pipe line, an important consideration in addition to careful visual inspection is proper testing. For instance, with hydrostatic testing high test pressures can be used safely in gas lines; if a failure occurs, the length of break is limited.

Field failures that do occur are principally in longitudinal or girth welds and in mechanical defects in the body of the pipe. Very few failures have been observed in seamless pipe. It is for this reason, in addition to the availability of seamless pipe in heavy walls, that seamless is frequently used for special applications in pipe lines, such as long underwater crossings, bridges and in densely populated areas.

The ASA Code for gas pipe lines, the API specifications for line pipe and the API standards for field girth welding (See PIPE LINE INDUSTRY, August, 1955, Page 25), have had an important effect in reducing the number of reported failures. Also improved field welding practices, freedom from gouges and lacerations, proper inspection and supervision have all contributed considerably to a reduction in the reported number of line pipe failures.

When Failures Do Occur . . . it is now possible to determine their origin providing there is no fire. In fact, recent fracture studies have made an important contribution toward improved pipe line behavior by making it possible in many instances to determine the cause of failure.

This is accomplished by observing the chevron pattern on the fractured surface. The apex of the chevron point to the origin of the fracture. Chevron patterns occur only on fracture surfaces which show cleavage

fractures in shear do not show chevron patterns, but it should be pointed out that there may be a shear lip at the edge adjoining the external surface of cleavage fractures.

In the future, improved methods of manufacture and better construction practices will further reduce the number of pipe line failures. Certain defects due to manufacturing practices, construction procedures or handling are responsible for many such pipe line failures. The basic problem is the elimination of such defects. This can best be assured at the present time by proper proof-testing of the finished pipe line.

It is important for all concerned to realize that a pipe line, unlike many other structures, can be properly proof-tested.

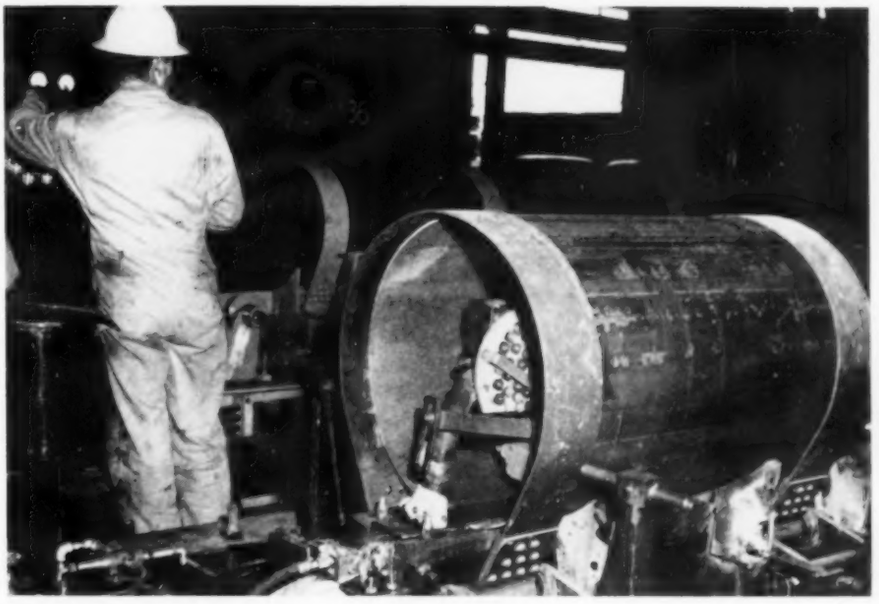


FIGURE 2—After tack welding the cans is ID submerged arc-welded with tandem electrodes. Note the starting tab—also the clamps which encircle the can during welding.

Future Steels Will Have Higher Toughness. In the future, special steels with superior toughness characteristics may be desirable for pipe lines operated at sub-zero temperatures or near pumping stations and in densely populated areas. These special steels are weldable without preheat and have a weld joint efficiency of 100 percent. Quenched and tempered steels do not normally meet this requirement and, therefore, hot-rolled or normalized steels are involved.

Killed steels in general have superior toughness characteristics and less segregation compared with semi-killed or open steels.

Lower levels of carbon content with increased amounts of manganese in the carbon manganese steels give high notch toughness. Use of alloy additions other than manganese permits the desired strength to be obtained with lower levels of carbon and normal manganese contents. Lower carbon not only improved the toughness characteristics, but also weldability. With a balanced chemical composition in low alloy line pipe steels, it should be possible not only to achieve toughness characteristics and weldability without preheating, but in addition, a higher strength level than can be achieved with the carbon manganese steels.

In the manufacture of many line pipe steels, cold expansion of the finished pipe is employed. This treatment increases the transverse tensile properties of the steel but does not enhance its toughness. Therefore, in the manufacture of special line pipe steels, the amount of cold work is limited.

Finally, in order to improve the toughness characteristics, the effect of a normalizing treatment should be considered. Usually, line pipe steels are employed in the hot rolled or cold expanded condition. The normalizing of aluminum killed steel not only produces uniform properties and a small uniform grain size, but also brings about a certain amount of fixation of nitrogen in the steel which is desirable with respect to toughness.

To evaluate the characteristics of line pipe one cooperative experimental program is investigating high strength low alloy TRI-TEN E steels. These steels in the form of plate, are usually provided in the as-rolled condition with a minimum yield strength of 50,000 pounds per square inch. When manufactured into pipe and cold expanded, minimum yield strength properties may approach 60,000 psi. Preheating is normally not required in welding.

A plain carbon steel and the TRI-TEN steel in the as-rolled and normalized conditions being investigated are shown in Table 1. Pipe diameters are 20 inches and 26 inches O.D. with 0.37-inch wall and the test pipe was manufactured by the submerged arc welding and expanding process.

In this investigation, girth welds will be tested. Tensile, bend, X-ray, magnetic inspection, Charpy V-notch, underbead cracking, burst, and hydraulic ring expansion yield strength tests will be conducted. Properties of killed steel and normalized steel will be evaluated in terms of the toughness of the pipe material. Line pipe with minimum yield strengths exceeding 52,000 psi are under development in addition to lower strength steels with superior toughness characteristics.

In high strength low alloy constructional steels used for structural purposes, it is customary to provide for atmospheric corrosion resistance by alloy additions due to the decrease in thickness of the high strength material. Pipe lines are vulnerable to the corrosive attacks of soil and not normally atmospheric conditions. Coatings and cathodic protection are widely used to protect pipe from external corrosion and coatings or inhibitor treatment may be used internally so in the development of special line pipe steels, corrosion is not ordi-

TABLE 1
Chemical Composition of Special Line Pipe Steels

Brand or Type of Steel	O.D. Inches	CHEMICAL COMPOSITION—PERCENT					
		C	Mn	Si	Cu	V	Ni
ASTM A201—Killed	20	.18	0.76	.22			.54
TRI-TEN—Killed	20	.18	1.11	.19	.46		
TRI-TEN "E"—Semi-Killed	26	.22	1.00	.06	.22	.05	
TRI-TEN "E"—Killed	26	.21	1.28	.21	.23	.05	

narily considered an important factor.

Due to the increased cost of the steels being developed and limited production facilities available for special treatments required, the use of these special steels will be limited.

110,000 Minimum Yield Strength Line Pipe. Line pipe steels with 110,000 psi minimum yield strength (grade X110) consist of tempered martensite. In the untempered state, martensite has long been considered brittle and this had led to the long standing reluctance of design engineers to permit the use of a quenched product.

More recently with increasing need for higher strength materials, metallurgists have re-examined martensite and have found that the low or medium carbon variety in the tempered condition may have high shock toughness and resistance to crack propagation with high strength properties.

This new concept of toughness, the toughness of low and medium carbon tempered martensite, has provided a new material for pipe line construction. This material should make it possible to use smaller diameter pipe at higher pressure. The economic advantage to be gained, however, remains to be demonstrated.

High strength seamless line pipe with 110,000 psi minimum yield strength has been experimentally produced from quenched and tempered steel. Two types of steel have been employed for the experimental tests; namely, (1) The "T_1" low-carbon tempered martensite steel, and (2) medium-carbon tempered martensite C-Mn steel. Chemical composition and mechanical properties of the steels are shown in Table 2.

Several Welding Electrodes Work Well with T_1 Steels. "T_1" steel is the toughest steel to be developed for line pipe application and may be welded with weld joint efficiencies approaching 100 percent. A high strength weld electrode is required. Special properties of "T_1" steel are due in part to the alloy additions making possible low carbon martensite and the vanadium content of the steel which enhances the strength of the weld heat-affected zone. Due to the cost of alloy additions in T_1 steel, a lower cost C-Mn steel has also been developed with 110,000 psi minimum yield strength. Tests indicate that this C-Mn steel should be satisfactory for many line pipe applications.

Utilization of low hydrogen Type E120XX lime electrodes for field welding grade X110 line pipe has been investigated. The use of the low hydrogen electrodes offers the advantage of eliminating preheating and underbead weld cracking. In addition, Type E120XX electrodes with powdered iron in the coating were investigated for line pipe welding. The advantage of electrodes with powdered iron is in the increased deposit rate. Results also indicate that a regular Type E10010 cellulose coated electrode with preheating is satisfactory for welding grade X110 line pipe.

Results of Weld Experiments. Cracks were not encountered with the low hydrogen electrodes and preheating was not required. Difficulty in welding was due to the entrapped slag which caused unsound welds. This was particularly observed when downhill welding was employed. Unsound welds were also obtained with the electrode containing powdered iron in the coating. These welds were preheated.

In the experimental work, various combinations of weld electrodes were employed. For example, a low hydrogen electrode was used for the root bead with the remainder of the weld of cellulose electrodes. Cellulose electrodes were also used in the root bead and a low hydrogen electrode for the remainder of the weld. The various combinations of weld electrodes did not overcome the objections to the low hydrogen and powdered iron electrodes. The objections were associated with unsound welds, particularly when downhill welding was employed.

Under proper welding condition the Type E120XX special lime electrodes used in this investigation which deposit weld metal with a minimum tensile strength of 120,000 psi are satisfactory for welding plate material. The technique used in pipe line welding, however, adapts itself to the cellulose type electrode as pipe line welders use downhill practice. The cellulose electrode employed in this investigation was Type E10010 and deposited weld metal with a minimum tensile strength of 100,000 psi.

For welding grade X110 line pipe material, a Type E120XX cellulose electrode would require development with minimum tensile properties of 120,000 psi and should be used in the field. A preheat of 350° F. with the cellulose electrode was found satisfactory for welding pipe of grade X110 "T_1" steel and C-Mn steel and a similar preheat should be satisfactory for a Type E120XX cellulose electrode.

In welding quenched and tempered C-Mn line pipe, the lower strength of the weld heat-affected zone lowers the longitudinal tensile strength across the girth weld. This condition may be improved with a cover bead of the proper shape which reinforces the weld heat-affected zone.

Burst test results indicate the lower strength of the weld heat-affected zone of the girth weld does not lower the bursting strength. This is due to the narrow width of the heat-affected zone. The strength of the weld heat-affected zone of "T_1" steel girth welds is similar to the original quenched and tempered material which has not been welded. The longitudinal tensile properties of "T_1" steel welds are, therefore, satisfactory and no special problems would be encountered which are related to this property.

In girth welding grade X110 line pipe, the use of 300° F. preheat may be used for the root pass followed with a hot pass. A 300° F. preheat should also be used for the filler pass followed by a hot pass completion of the remainder of the weld. This procedure involves two preheating treatments and the use of a Type E120XX cellulose electrode. In addition, the cover or face bead should be of sufficient width and height to strengthen the weld heat-affected zones associated with the root and filler weld beads.

In addition to quenched and tempered steels for 110,000 psi minimum

TABLE 2
Chemical Composition and Tensile Properties of Grade X110 Line Pipe Steels

TYPE	Pipe Size	C	Mn	Ni	Cr	Mo	V	Cu	B	Yield Strength psi*	Ultimate Strength psi	Elongation in 2" Percent
C-Mn	9⅝" O.D. .472" Wall	.27%	1.23%	.....	.....	.....	.....	.....	.....	128,000	140,000	22
C-Mn	9⅝" O.D. .472" Wall	.33	1.35	.....	.....	.....	.....	.....	.....	119,000	133,000	21
"T_1"	6⅝" O.D. .250" Wall	.13	.85	.91	.58	.44	.055	.34	.0026	118,000	128,000	22
"T_1"	8⅝" O.D. .250" Wall	.15	.86	.86	.59	.41	.055	.35	.0026	116,000	124,000	23

* .6% elongation under load. Specimen 1½" wide.
P .05% max., S .06% max., Si .10-.30%.

ield strength, there are other steels hich may be considered. These are ir hardening alloy steels in the nor- nalized or stress relieved condition. Due to the higher carbon content f these special steels, the problems ncountered with welding require ery special consideration. The yield rengths to be obtained would exceed 5,000 psi but would not equal the quenched and tempered products.

Submerged Arc Welded Line Pipe. In the manufacture of submerged arc welded line pipe, it is customary after the forming operations to weld with tandem electrodes the O.D. and then the I.D. of the pipe. By a newly developed procedure the pipe is tack welded in the jig shown in Figure 1 after forming. After tack welding the I.D. weld is applied with tandem electrodes as shown in Figure 2. This is followed with the O.D. weld as shown in Figure 3. After O.D. welding the pipe is expanded in the usual manner. This modified practice for manufacturing submerged arc-welded line pipes eliminates the necessity of special end welds with a minimum amount of tack welding.

Although API pipe specifications do not provide for radiography in the manufacture of submerged arc-welded line pipe, it is used as a process control procedure and is the most reliable test available at the present time for this specific purpose.

Distribution of individual slag inclusions and gas pockets in any location as well as the maximum distribution of aligned gas pockets at any spot are based upon 175 transverse weld tensile tests with discontinuities. A large number of transverse weld tensile tests consisting of sound weld metal adjacent to the tests with discontinuities are also considered. In addition, many transverse tensile tests were made of the pipe material without any weld.

Manufacturer's standards for discontinuities are not exactly similar to API Standard 1104 for field girth welding. This is due to the fact that the standards are particularly adapted to automatic double submerged arc welding with the plate edges to be welded adjacent to each other. This entirely different welding practice is superior to the manual metallic arc all position welding of a V-groove with three or more passes without the use of a back-up strip which is em-

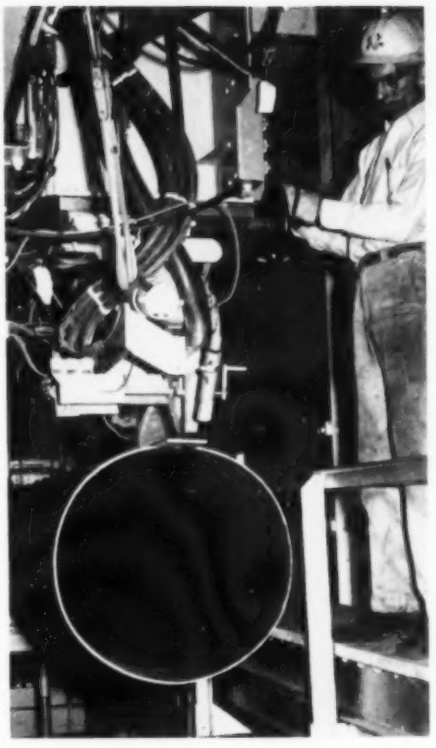


FIGURE 3—After ID welding the can is OD submerged arc-welded with tandem electrodes. Note the starting tab at the end of the can. Similar tab is at other end.

ployed in the girth welding of line pipe.

New Way to Control Weld Quality. A new method for continuous X-ray examination of line pipe has been developed which does not require the use of a film. Now in the experimental stage, the method has possibilities of providing an X-ray technique at a lower cost for examination of not only the longitudinal weld, but also the field girth weld. Elimination of the use of a film and the direct visual examination of steel for internal weld defects is indeed a new approach in this country to control of weld quality in the manufacture of line pipe.

Welding Grade X52 Line Pipe. In an extensive investigation of API Standard 5LX grade X52 line pipe, the weldability characteristics of two heats of steel shown in Table 3 were investigated. Pipe tested was 36 inches in diameter with ⅜-inch and ½-inch walls and was in the expanded condition. Tests were conducted under the supervision of the United States Steel Applied Research Laboratory with the cooperation of Canadian-Bechtel, Ltd., the Armour Research Foundation, and several other pipe manufacturers.

Girth welds in the 36-inch O.D. pipe were made at 0° F., 70° F., 150° F., and 300° F. E6010 electrodes were used for the root pass and E7010 electrodes for the remainder of the weld. The transition temperature was determined with notch bend and Charpy V-notch tests. Underbead cracking tests were made. After magnetic testing and X-ray examination, girth welds were given tensile, bend, nick-break, hardness, and metallographic tests.

Results indicated that when ½-inch wall, X52 line pipe is field welded, a preheat temperature of approximately 300° F. should be used to obtain good weldment performance. When ⅜-inch wall, X52 line pipe is field welded at approximately 70° F., preheating apparently isn't needed to obtain good weldment performance. To prevent underbead cracking in the girth welds of ⅜-inch wall line pipe at lower temperatures approaching 32° F., preheating to 70° F. or higher is desirable. Preheating when required should be employed before deposition of the stringer pass and a hot pass should follow the stringer bead. If the pipe cools before deposition of the filler passes, preheating should be employed before resuming welding and the weld should be completed before the pipe cools to ambient temperature.

The notch bend transition temperature as determined by the Kinzel notch bend testing technique is shown in Table 4. Underbead cracking susceptibility test results shown in the same table, are based upon a severe weld test. Experience has indicated underbead cracking in field line pipe girth welds may be encountered when the underbead cracking in the laboratory test exceeds 50 percent.

Charpy V-notch impact test results

TABLE 3
Chemical Composition and Tensile Properties of 36-Inch O.D. Line Pipe

HEAT No.	Thickness	CHEMICAL COMPOSITION, PERCENT C	Mn	P	S	Yield Strength psi	Ultimate Strength psi	Elongation in 2 Inch Percent
65P374	⅜"	.22	0.88	0.020	0.031	53,950	72,300	33
	½"	.23	0.87	0.020	0.032	51,450	72,750	36
72P415	⅜"	.33	1.10	0.016	0.027	59,650	87,300	33
	½"	.33	1.12	0.017	0.029	53,900	87,950	32

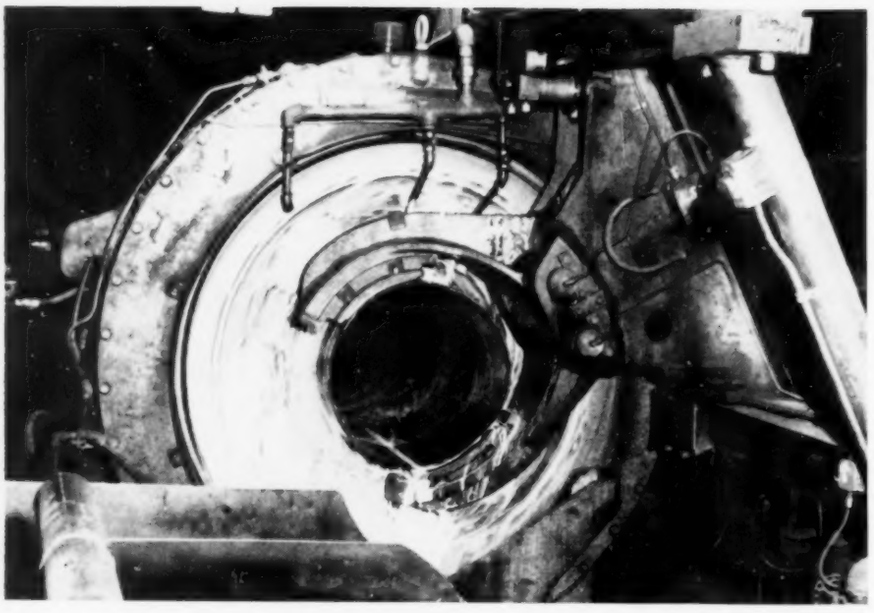


FIGURE 4—Cut-off machine for expanded seamless pipe. The six tool cutting head revolves around the line pipe.

shown in Table 5 are particularly interesting in that the transition temperature of E7010 weld metal was very low. Tensile, bend, nick-break, and X-ray tests were made in accordance with API Standard 1104 which is used for field welding. The results indicated the preheat temperatures recommended in the preceding paragraph were desired to prevent weld cracks.

The low hydrogen electrode was not used in the investigation described, as experience over a period of many years has indicated this electrode is not satisfactory for downhill line pipe welding. The difficulty encountered is due to the nature of the slag, resulting in the production of unsound welds. There were no cracks observed in the line pipe material experimentally girth welded a number of years ago at temperatures of 25° F. and higher without preheating or postheating with a low hydrogen electrode.

Although the low hydrogen electrodes are not entirely satisfactory for field girth welding, the use of these electrodes in hot-tapping oil and gas lines should be considered, as preheating is not required for ordinary line pipe materials. Welding with low hydrogen electrodes after the pipe line is in operation should be given serious consideration since it is difficult, if not impossible, to effectively preheat material on the outside which is continually being cooled on the inside.

Special Welding Processes. In addition to submerged arc welding process, electrical resistance and flash welding processes now used for the manufacture of line pipe, new methods for the automatic welding of pipe in the experimental stage include the use of inert atmospheres of argon, helium, or carbon dioxide. A bare electrode of suitable composition is employed. It is possible that the use of inert gas welding may provide a means for automatic girth welding of line pipe in the field as its application to the manufacture of pipe will be limited due to the use of submerged arc welding.

In girth welding with inert gas, welding in the overhead position ha been responsible for undue porosity Use of the automatic submerged ar welding process with granular flux not practical in the field for weldin the entire pipe line due to the nece sity for rotating the pipe to maintai a flux blanket. This process, howeve has been used successfully for wel ing several joints of pipe under fiel conditions by rotation of the pip during welding.

1-RT Welding Process. A new wel ing method known as the 1-R welding process provides for sing electrode metallic arc welding a welding speeds otherwise attainabl only with tandem electrodes. Thi method of welding in the future ma be adaptable to both inert gas and submerged arc welding processes. It has been experimentally used in the production of submerged arc-welded line pipe.

Expanded Seamless Line Pipe. After manufacturing, hot rotary rolled seamless line pipe in 16 inch-26 inch O.D. sizes may be expanded in a continuous operation if higher transverse tensile properties are desired. In this unit the pipe, as it leaves the seamless hot mill, enters a cut-off machine as shown in Figure 4, which trims both ends. In these machines instead of the pipe rotating as in conventional cutters, it is held stationary as a six-tool cutting head revolves around the end, cutting through from the outside. The machines are controlled automatically by means of electronic devices.

The pipe is next conveyed to the expander as shown in Figure 5. Here it drops into the expander trough and one end is held firmly against the backstop. A 60-foot ram made of 14-inch seamless pipe is positioned at the opposite end of the pipe, the expander plug is fitted on the bar cap and the ram, under 300,000 psi pressure (1500 Hp) forces the plug through the pipe.

A set of five plugs is used in sequence to permit uninterrupted operations and cooling of plugs between use. These plugs are built-up discs fitted with nickel-chromium iron alloy rings. The plugs are 8½ inches thick. They expand the pipe to the nominal outside diameter.

Power is supplied to the ram through an electrically driven gear reduction unit. Two heavy chains, one on each side, are attached to a cross-head to drive the ram. The plug

TABLE 4
Notch Bend and Underbead Cracking Results

Heat No.	Thickness	Initial Temp. °F.	Notch Bend Fracture Transition Temperature °F		Underbead Cracking
			Ductility* Transition	Fracture† Transition	
65P374	⅜"	0	25	35	1½
		300	8	31	0
	½"	0	82	86	4
		300	28	70	1
72P415	⅜"	0	15	48	54
		300	14	36	0
	½"	0	86	108	59
		300	29	79	0

* 20 Degree Angle of Bend. † 50 percent Shear.

TABLE 5
⅔ Size Charpy V-Notch Impact Test Results

Heat No.	Plate Thickness Inches	Transition Temperature °F.*			
		Base Metal		Weld Metal	Heat-Affected Zone
		L†	T†	L	T
65P374	⅜	16	34	−88	2
	½	38	53	−90	18
72P415	⅜	6	34	−64	−6
	½	36	38	−116	2

* Temperature at 10 ft. lb. energy absorbed.
† L—Longitudinal direction.
† T—Transverse direction.

lubricated from a reel, through the ram, and to the bar cap. Clamps which hold the pipe in the expander are operated by a hydraulic oil system at 2000 psi pressure.

After expansion, the pipe enters first a rotary straightener and then is conveyed to a rotating inspection table for inspection. After beveling the pipe ends, the pipe is again inspected for surface and end flaws. Afterwards, it is hydrostatically tested to a pressure that exerts a fiber stress equivalent to 85 percent of the specified minimum yield strength.

Pipe manufactured by this new process is uniformly cold worked in the transverse direction. Seamless pipe about 40 feet long may be expanded in 60 seconds at the rate of 175 feet per minute. Depending upon the size, seamless pipe is produced on this unit at the rate of about 50 tons per hour.

The diameter of the pipe is increased during cold working, and although a water soluble oil is used as a lubricant, there is a slight temperature rise in the pipe during expansion. The pipe length is reduced about 1½ percent with less than 1 percent change in wall thickness. Cold working seamless pipe in the transverse direction increases the yield strength at least 10 percent and the ultimate strength 3 percent or more.

Typical chemical and mechanical properties of expanded API Standard 5LX grade X52, 0.375-inch wall, 24-inch O.D. seamless line pipe are shown in Table 6. Seamless pipe manufactured by this process, has been found to be entirely satisfactory in the field and has met all the requirements of the various specification and code making bodies. The absence of a longitudinal weld has made it possible to use the cold expanding process described. A burnishing action on the inside surface results from the use of the steel plug. Expanding of seamless pipe also improves the outside surface quality of the product.

Ways to Determine Yield Strength. One of the tests required in the manufacture of line pipe is the determination of yield strength in psi at 0.5 percent elongation under load. This property is used as a basis for pipe line design. One method of determining yield strength is the hydraulic ring expansion method. This is described in ASTM Specification A-370-53T. A view of the equipment used for testing large diameter expanded seamless pipe is shown in Figure 6. This method of testing provides yield strength data without flattening the specimen. A pipe ring three inches in length is used and the ring is sealed with rubber gaskets. It is then hydraulically expanded until it yields.

TABLE 6
Nominal Chemical and Mechanical Properties of Expanded Seamless Line Pipe

CHEMICAL COMPOSITION, PERCENT			
C	Mn	P	S
.27	1.03	.012	.028

TRANSVERSE MECHANICAL PROPERTIES			
Yield Strength psi	Ultimate Strength psi	Percent Elongation in 2 Inches	Yield/Ultimate Ratio
61,000	80,000	34	.788

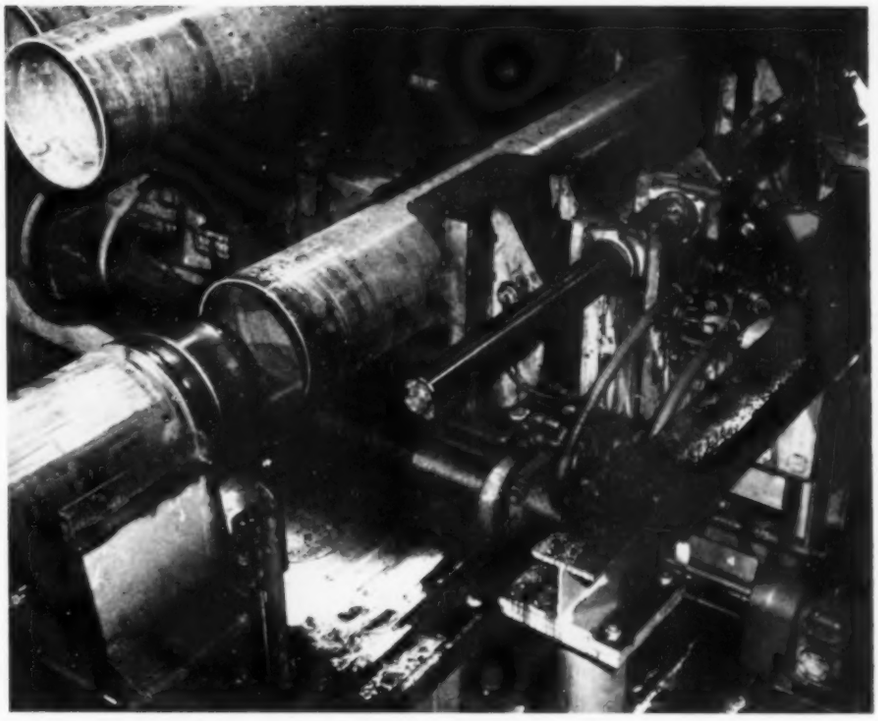


FIGURE 5—Expander showing expander plug in position before entering seamless pipe. Note the clamps which hold the pipe in position before expanding.

ACKNOWLEDGMENT

The author wishes to acknowledge the cooperation received from the management and operating personnel of the American Bridge Division, United States Steel Applied Research Laboratory at Monroeville, Consolidated Western Steel Division, and National Tube Division of the United States Steel Corporation. The Bechtel Corporation and A. O. Smith Corporation cooperated in the welding tests which added much to the results reported in this investigation.

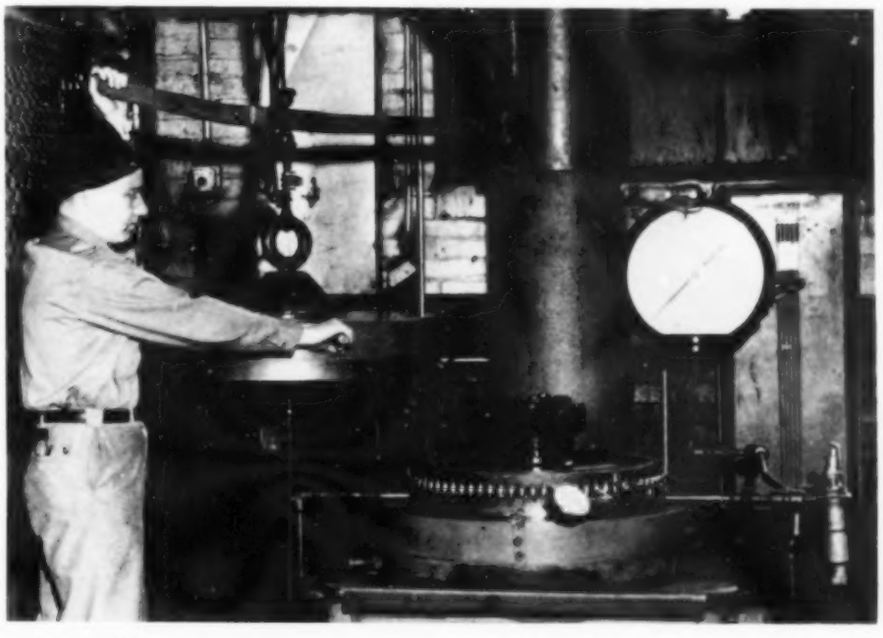
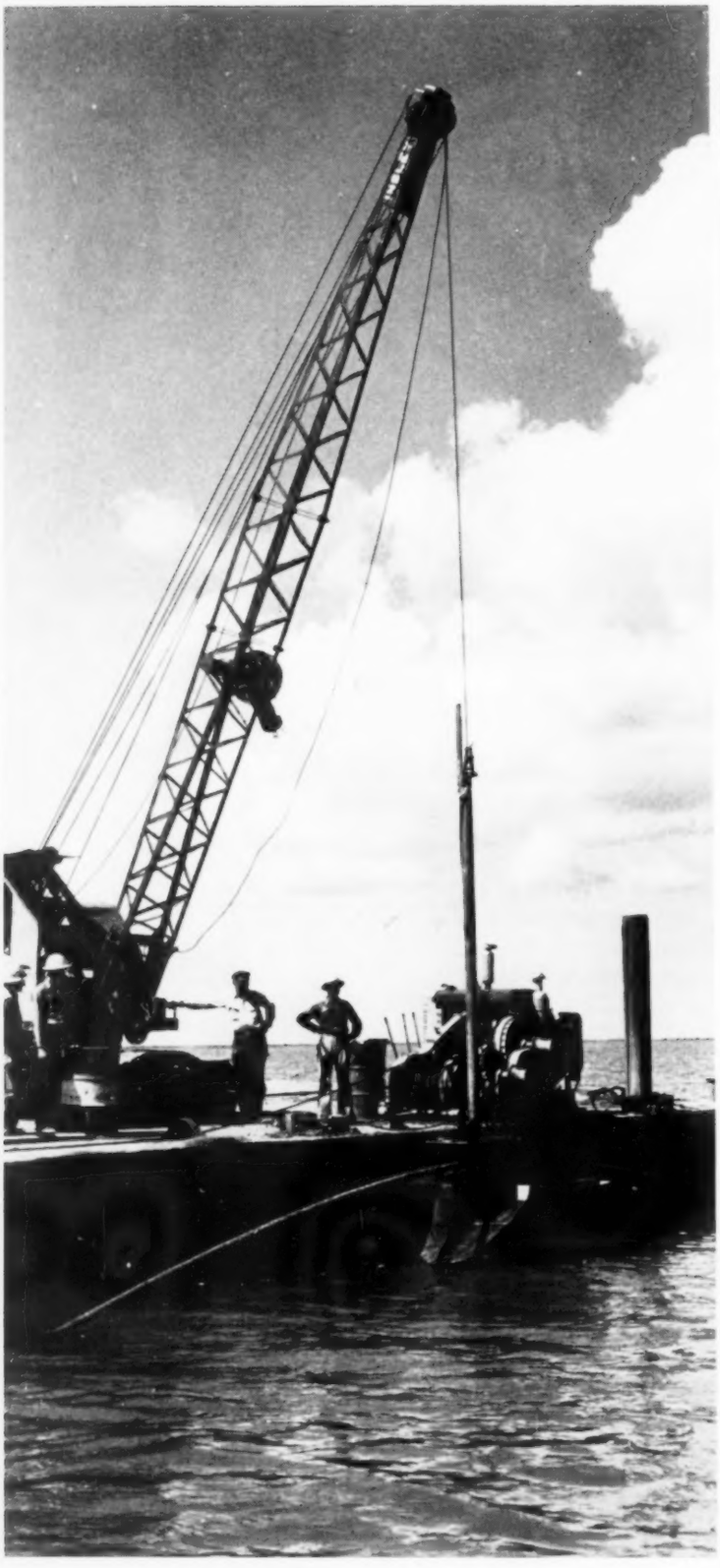


FIGURE 6—Hydraulic ring expansion test for yield strength determination of expanded seamless line pipe at Lorain works. The gage for measuring expansion is attached to the chain which encircles the test ring. The operator is about to place the head on the machine before applying hydraulic pressure.

This drawing shows the "team" at work laying a line under a mud bottom. The three-joint pipe sections are assembled on lay-barge and fed to the plow as the spud barge pulls the lay-barge ahead. The tug



Plow, with four-inch line already threaded through, is ready to be lowered to bottom. This shows how plow and line would look on bottom. A similar arrangement would be used to bury an old exposed line.

GIANT PLOW LAYS

PIPELINERS WITH Humble Oil & Refining Company have borrowed an idea from the farmers and put it to work profitably in marsh line construction. Small submarine pipe lines are being plowed into the mud of South Louisiana with a giant underwater "middlebuster." It was devised by the men facing these special problems every day, and earned $200 for Welding Supervisor B. B. Box under Humble's "Coin-Your-Ideas" program.

The plow seems almost too simple to function. Pipe feeds through rollers encased in a metal frame, attached to the plow. As it is pulled along the bottom, the plow lays back the mud and the pipe feeds directly into the open ditch. Rigged for operation, the completed plow weighs approximately 1000 pounds. It measures 4-feet by 4-feet and costs about $900 to make.

Tug and Spud Barge Tows Plow. Equipment needed to lay the line includes a tugboat, two 100-foot work barges, and the plow. The tug boat moves the spud-barge ahead periodically during the laying operation. The spud barge is equipped with winches and towing-cable to exert a steady straight pull on the lay barge. As the lay barge is pulled ahead the plow trails it some twenty feet, burying the pipe.

moves the spud barge ahead periodically during the main operation and the spud barge will bring the lay-barge ahead as the line is buried.

MARSH LINES IN A HURRY

This novel piece of construction equipment is cutting the cost of laying small diameter lines under mud bottoms of shallow bays and marshes in South Louisiana. A tug-boat, two work barges, and the plow teamed up to lay 35,000 feet of 4-inch line in only two days.

Designer B. B. Box checks fabrication on 1000-pound plow.

Tide Action Covers Pipe. Tide action back-fills the pipe line in a month or so. Inventors of the plow are now working on a scoop-type backfiller to be pulled about 40 feet behind the plow. If this is successful, the complete job of ditching, laying, lowering-in and back-filling could be completed in one operation.

The plow can also be used to reclaim marsh lines, it can be started on one end of a buried line, strip back the cover and lift the pipe off the bottom just as it would plow it under.

Laying and maintaining pipe lines in salt-water bays and marshy areas has presented two special problems in the past:

- Barnacles may destroy the protective coating if the line is left uncovered; leaving sections subject to the corrosive action of salt water.
- Cooling effect of the tide action over exposed lines can often cause a freezing of hydrates in gas lines during the winter months.

Burying the line below the bottom of the bay can eliminate both of the above problems—the only draw-back being the cost of such an operation. A trench could be obtained by dragline, or by water jetting, but these procedures are costly and time consuming. In both methods an inspection by divers is necessary to assure proper lowering-in of the pipe, adding further to the laying time and cost.

Rocky Bottom, Stumps and Other Lines Stymie Plow. The "buster" does have some natural limitations. It is designed primarily for use in shallow bays and marsh areas, and as such would probably not be suitable for burying lines in deep water or off-shore locations. Stumps, logs, foreign lines, and rocky formations all tend to slow the operation down. In attempting to bury an old exposed line, extreme side bends may slow progress.

ACKNOWLEDGMENT

From *The Humble Way*, Humble Oil & Refining Company publication, September-October, 1956.

If Oil Could Speak

If oil could speak it would have many fascinating truths to tell the non-oil public—truths that would win thousands of new friends for the oil industry.

But, oil can't speak—you can. You, as an individual, can win many new friends for the oil industry, if you will pass the true facts on to your non-oil industry friends.

This article—the first in a series—is being presented for one purpose: To equip you with as many facts as possible about your industry, so you can tell the story that oil is unable to relate.

Read these facts. You will find them informative—and interesting.

EVERY OIL WORKER, from field man or secretary to chairman of the board has a stake in the public's attitude toward the oil industry.

If the attitude is bad, then the worker's chances of a better job in the future are bad. If the attitude is good, then his chances are good.

What can create a better public attitude?

The truth, nothing but the truth.

The average John Q. Public, the voter, your friend who isn't in the oil industry, is daily being fed misrepresentations by somebody outside the oil industry. Occasionally somebody in the oil industry makes a bad bobble and the nation's press plays it to the hilt—with bad results to you and your job.

The truth is enough. If you can pass a few truths on to your friends who live next door, but are not in the oil industry, or whom you go to visit at night or who visit you—*that* is *your* part of a campaign for better understanding.

That is all any of us in the oil industry can expect—a better understanding—that is all *you* can do, help, among your friends, to create better understanding.

For instance there is the neighbor who thinks that oil men have a happy knack of going out and drilling a wildcat well—with consequent riches. *You* know better. There is the bridge (or poker) partner who thinks three or four large companies refine all the nation's oil. *You* know better.

How, specifically, can you help?

PIPE LINE INDUSTRY has, with the help of reputable industry sources, compiled some pertinent *facts* you can pass on. Below you will find some of them. Future issues will contain more facts under the heading—"If Oil Could Speak."

Look for these facts—use them. Chances are you will find them very interesting to yourself—and we think your non-oil friends will be interested in hearing them from you.

Here are the facts: "If Oil Could Speak" it would tell the American public . . .

• One out of every 38 workers in the U. S. is employed in the oil industry. The million-plus oil employes are paid the second highest wages in the nation.

• Thirty of the larger oil companies have been forced to borrow over $5 billion in the past 20 years, despite assertions from various sources that the 27½ percent depletion provision is excessive.

• Eighty percent of all oil consumed in World War II came from U. S. wells!

• The average Texas oil well produces 20 barrels a day, compared with a national average of 14 barrels a day. The average well in the Persian Gulf produces 5000 barrels of oil a day.

• Within 25 years total demand for oil products has nearly tripled—from 3 million barrels a day to well over 8 million barrels a day. The oil industry has met this tremendous growth in demand—and to spare!

• Despite a tremendous consumption of over 41 billion barrels of oil since 1926, the known reserves are higher today than at any time in U. S. history.

REMEMBER: OIL CAN'T SPEAK—YOU CAN. ONLY YOU CAN GIVE NON-OIL PEOPLE THE TRUE FACTS ABOUT YOUR OIL INDUSTRY.

Perk Up Your Employe Communications

A prominent psychiatrist outlines the basic problems of employe communications—then offers ways to solve them.

By **DR. ALAN A. McLEAN**
Hartsdale, N. Y.

ONE OF INDUSTRY'S most constant and perplexing challenges is to promote a climate favorable to the growth of understanding between employes and management.

A company can supply the best of equipment, materials and methods, and the worker can bring on the job the best training, experience and health, but unless his attitude is a healthy one, he won't turn out much work.

There is one sure way to create a healthy attitude among employes: *Create a healthy communications environment.*

How can good communications be created? Here are some answers:

Feedback—The audio-engineer who studies communication by means of electrical circuits and oscillographs is inclined to think in terms of a communicated signal.

With a sound, he is quite aware of the fact that the more distortion, the less information coming across and of course, the less the noise, the greater the clarity of the information. In short, the undesirable interference with the communication monitored by the audio-engineer is measureable through a process of checking the signal at various points to determine the amount of distortion.

The industrial communicator has no such built-in feedback reports to accurately indicate the effect of his communicated information and the clarity of his signal. To be sure, he has some indications of the receptivity and the reaction of his audience. These are not entirely accurate and offer many limitations. The signal cannot be changed or monitored as it eminates from his pen.

The first major point then, is that *we cannot think of clear cut, precise message reception.* We must consider that *interference and distortion also convey valuable information.* The editorial comment accompanying factual information is sometimes far more important and more meaningful to a group of employes than bare facts.

A reduction in the amount of interference, noise, static and distortion in communicated messages is important. So, too, is understanding of the noise and distortion when it is present. And understanding reasons behind the seeming distortion and static is equally important.

The psychiatrist generally is struck by the fact that no single message has the same meaning for each person involved. Each brings into the communication system individual motives, values, feeling and in short, his individual background and way of looking at things.

How does one communicate?

The smile on the face of the supervisor as he circulates a memorandum from top management is perhaps more important than the memo itself. By leaving unsaid as well as by saying, by ignoring rumors or by answering them, by verbal inflection and attitude, communication is born.

Let's take a look at several currently popular methods of communication on the industrial scene.

Initially Negative News—At times, in an effort to clarify misleading information and rumors, management may issue a denial. On the face of it this seems quite logical. The same automatic, almost reflex impulse to communicate in order to deny is found more often in day to day relationships in any plant. Sudden contradictions and exceptions to long established procedures and policies are occasionally necessary. But when presented without explanation and in a seemingly critical and contradictory fashion, they only serve to arouse feelings of hostility.

For instance, if a news story in a company publication were to report that it was *not* true a certain number of plants were to be sold to a competitor, feelings of insecurity and anxiety would develop in many individual employes. And if a first line supervisor were to abruptly challenge, without explanation, the way a technician was handling a routine assignment, he would meet with considerable resistance.

Presenting information of any sort in a negative way is always likely to arouse suspicion, doubt, resentment and hostility. On the other hand, with explanation of the reason why a company feels it necessary to present negative news, there is a fair chance of allaying these same feelings.

Overcommunication—In an ef-

About the Author

ALAN A. McLEAN is a psychiatrist, serving American Cyanamid Company and New York Telephone Company as a psychiatric consultant, Cornell University as a faculty member in its College of Medicine, and The New York Hospital as part of its attending staff. Educated at the University of Washington in Seattle, New York University and Long Island College of Medicine, Dr. McLean received his psychiatric training at Western State Hospital in Tacoma, Wash., at Oregon State Hospital in Salem, and at Cornell in the College of Medicine and the School of Industrial and Labor Relations.

There Are Four Basic Fallacies in Modern Management's Approach to Employe Communications:

1. **Handling of Initially Negative News.** At times, in an effort to clarify misleading information and rumors, management may issue a denial. On the face of it this seems quite logical. But, when presented without explanation and in a seemingly critical and contradictory fashion, they only serve to arouse feelings of hostility.

2. **Overcommunication.** In an effort to communicate effectively, some managements overdo the process and swamp the circuits with too many messages. **The time to communicate is when you can answer more questions than you raise.**

3. **Distorted Communication.** It is not always easy or possible for the receiver to identify the underlying attitude of the sender. When management takes for granted that its message will be perceived by the employe as being sincere and straightforward, this is quite often not the case.

4. **Communications Lack.** Many companies suffer from a dirth of information flowing either up or down communications channels. No business can be conducted in a vacuum. This is particularly so in the dynamic oil industry.

fort to communicate effectively, some managements overdo the process and swamp the circuits with too many messages. These may include needless exhortations, petty comments and irrelevant details. It may include bringing too many people into a problem. It may mean a barrage of so many formal and informal communiques, magazines and newspapers and policy statements that it becomes impossible for any employe to keep up.

In any of these situations important information is apt to be lost in the shuffle. It is certainly possible to overdo a good thing. Another aspect of overcommunication is what might be called communication *before the fact*. This refers to communications of half-formed policies and also to rumors that are intentionally spread to sound out various groups of employes—the well known trial balloon technique.

Many necessary industrial moves, such as the relocation of machinery or the introduction of new procedures, involves change for individual employes. Any communications on these subjects is liable to be anxiety producing. Premature news concerning these subjects can be disturbing. *The time to communicate is when you can answer more questions than you raise.*

Distorted Communication—The underlying attitude and feelings, the individual values and ideas of individual employes—all these must be taken into account in planning a communication or in working on a communications problem.

We might say that the effectiveness of any given communication is determined by its clarity and even more, by what the receiver understands of the spirit behind it. Yet it is not always easy or possible for the receiver to identify the underlying attitude of the sender. When management takes for granted its message will be perceived by the employe as being sincere and straightforward, this is quite often not the case. One common pitfall is to assume that there is a basic agreement underlying the relationship between management and the individual worker when this is simply not so.

In its monthly news letter to the employes, a company management may insist that, at the present time industry is extremely competitive—that it is therefore urgent for each worker to increase his output so that the company may continue to get its share of available orders. This would seem to be perfectly reasonable. Yet it may be interpreted by employes as an attempt to simply speed up production with an inevitable lay off around the corner once current orders are filled.

Communications Lack—Many companies suffer from a dirth of information flowing either up or down communications channels. No business can be conducted in a vacuum. This is particularly so in the dynamic oil industry. A lack of communication seems most particularly destructive in the face of impending change. Major management decisions frequently must be made in a relative vacuum. On the other hand this does not mean the majority of changes must be put into effect precipitously and without accurate warning. With no communication in a situation where it is widely known that a change is about to take place, many rumors spring into being with the result of much confusion and uncertainty.

A partial communications lack is embodied in the policy, "We tell them only what they want to hear." How smart a maneuver is this? This occasionally applies to communications directed from management to the hourly group. But passing only pleasant facts upward through various levels of management is more often the case and contributes to gross inefficiency. Sure, we all like to hear about the good things of life. No one likes to arouse antagonism in his supervisor. The creation of a climate in which such communications can be presented without fear of unjust reprisal is one of management's important tasks for effective two-way communication.

The cornerstone of sound employee relations is the practical application of well understood concepts and policies of good communication.

—The Ed

Lava rock licked by LORAIN Pipeliner

Digging deep through shot lava rock is just part of the job for this Lorain-50 Pipeliner on the 95-mile long section of 22-inch natural gas line Midwestern Construction Co. of Tulsa, Okla., is laying from Burley to Hot Spring. This is part of the line for Pacific Northwest Gas Line Corp. of Houston, Texas, that will run from the San Juan Basin to Seattle.

This dependable 1-yd. Lorain Pipeliner is just one of several sizes of Lorains available. Lorains in this class have many features that fit them especially to pipelining. Here are a few. New, 2-lever, "Metered-Air" operation is easier, faster and simpler — requires only 2 "Joy Stick" levers to apply "Air-Ease" power to all turntable operations. Operator retains full, normal "feel" of clutches. Here's a new concept in fingertip control. For crane, dragline and clamshell work, Lorain has introduced a boom of new square-tubular-chord design that is lighter, yet stronger, and permits increased lifting capacities and greater bucket ranges. The new available "Shear Ball" turntable mounting, requires no center pin or nut, no rollers to wear, no adjustments. This new innovation provides a smooth, rock-steady, "ball bearing" swing.

These are but a few of the latest Lorain advances that every pipeliner should investigate. Lorain Hoes are available in sizes from 3/8 to 2½ yds.—cranes from 7 to 75 tons. There is a wide selection of crawlers or rubber-tire carriers. Ask your Thew-Lorain Distributor to help you compare Lorains—feature for feature, when you are ready to add to your spread.

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Management's 'Forgotten' Men

Many pipe line companies are overlooking an untapped source of executive talent: The 'middle men' of management.

By JOSEPH M. TRICKETT
Food Machinery & Chemical
Corporation, San Jose, California

MIDDLE MANAGEMENT is an important area of the pipe line industry—and on this organizational level are likely to be found the "forgotten men" of management.

These men are neither chief executives, nor are they currently in front-line management or supervision. Yet they constitute an excellent pool from which the industry can recruit many of its top flight executives.

Result: A fast-growing trend to seek out more executive talent from the ranks of middle management. The reasons behind this trend can best be explained by reviewing three related questions:

1. Why is management development of increasing and vital importance to the pipe line industry?
2. What is the role of middle management in a company's management development program?
3. How is personal development involved in management development?

Why Management Development? It is no accident that, during the past few years, most of the well-known companies in America have become interested in management or executive development. In fact, over 75 percent of all large companies in the country have some formal approach to the development of their executive material. About three-fourths of these have had management development programs for no longer than seven years.

About the Author

JOSEPH M. TRICKETT has been coordinator of management development for Food Machinery and Chemical Corporation at San Jose, Calif., for the past year. Previously, he was with the American Management Association in New York, where he conducted a nation-wide survey of management-development activities. His other experience includes six years as dean of the School of Management at San Francisco's Golden Gate College; five years as director of organization management with Columbia Steel Company, and similar activities with Standard Oil Company of California. Dr. Trickett is a graduate of Washburn University and holds M.B.A. and Ph.D. degrees from Stanford University.

Several factors have combined to bring about this new interest in executive growth and development. First, there is the changing picture in business itself. The job of management in business today is markedly different from what it was 15 years ago.

Throughout industry of all types and sizes, within all functions in business, there are new demands upon managerial skill and ability. The very impact of a new and fast-changing technology, the changes in the marketing and distribution picture, and the highly dynamic and volatile human relations problems are familiar. And these are only the beginning. As Peter Drucker has pointed out in his challenging look at *The Next Twenty years:*

"The greatest educational need may well be in management . . . the "intuitive" manager is obsolete; and "experience" will not be a very reliable guide . . . indeed it would be hard to find an institution of learning where he could acquire today the education he needs to be a manager tomorrow. But, in the sense of being able to handle systematic knowledge, he will have to be highly educated.

"This educational job will have to be done, to a very large extent, in and by the business itself . . ."

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To be successful, management development *must* be based on a sound philosophy. If you can answer "yes" to these seven questions your development program has every chance for success . . .

Do you have:

1. **A broad statement of policy to crystallize the philosophy and synthesize the determined objectives?**
2. **Some procedures and "tools" to implement this policy?**
3. **Participation by top line management?**
4. **Provision for application within the entire management team?**
5. **Identification of available management development resources?**
6. **Almost unlimited subject matter coverage?**
7. **Provision for continuous, long-term "action," with feed-back controls to assure such continuity?**

within American industry which has emphasized the need for developmental activities is the transition from a proprietary- to a professional-management group.

One qualified observer, Robert McMurry, points out that this change began right after World War I and is continuing through the present. He says that the problem of finding and developing qualified, professional managers is a fairly new one; that until World War I, there was relatively little need for managers of this kind since most businesses were managed by their owners.

The trend during the past 25 years toward the separation of ownership from management, plus the increasing complexity and size of business operations, has fostered the growth of the professional manager. Not only does this new professional manager know that he must be particularly and specifically trained to handle what he calls his *"trusteeship responsibilities,"* but he knows that he has a continuing and pressing responsibility to keep up in his chosen profession.

There is a third related factor in this new interest in executive growth —it has even been likened to a managerial renaissance. A few years ago, several qualified observers, among others, pointed a change in the outlook, in the attitude, of existing managers. This is generally shown by a new willingness to learn, a new recognition of room for personal growth and improvement, a seeking of methods to improve one's personal efficiency and effectiveness.

The phenomenal growth in variety and number of management programs in colleges and universities throughout the country, overwhelming demands for enrollments in seminars and programs of such organizations as the AMA and the N.I.C.B., and the great increase in demand for management literature of all sorts are symptomatic of this new interest, of the managerial enlightenment.

What is Management Development? Any discussion of the importance of management development today requires some definition of terms, for, like most of the terminology of modern business administration, there is a great deal of confusion and even contradiction.

In the minds of many, management development means something to be done today to young and inexperienced men to make them qualified to assume managerial responsibilities tomorrow.

To others, management development means "sending two men each year to Harvard" or some other such university program.

To a few, the term means replacement charts, age-of-incumbent analyses, manning tables for the very top positions in the company hierarchy. And to some it means the training classes, outside written material sent to individuals, or other efforts to improve quality of company foremanship or supervision.

Management development, of course, means all of these things.

Management development is a continuous process or activity which is concerned with selection, organization, maintenance and improvement of management personnel throughout the organization. As such, it is a three-fold responsibility—of each individual, for his self-development; of each boss, for the development of his subordinates; of the company as a whole, to provide each boss with adequate tools, procedures and guidance.

Objectives and Philosophy. It has been pointed out again and again by many recognized management authorities, that effective management development is more a philosophy of management than it is a system of forms and procedures. Yet many companies seem to have adopted and adapted the trappings without formulating, accepting, and internalizing

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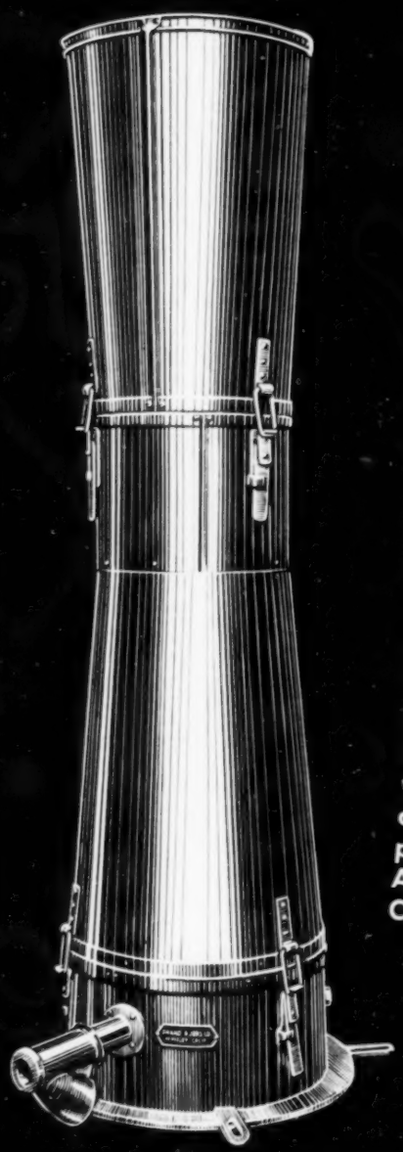

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Leadership begins with the individual. Here are six excellent keys to self-managerial development . . .

1. **Begin now to recognize and keep up with the latest developments in your chosen profession of management.**
2. **Look to your personal development on a continuing basis. This includes your ability to write and speak effectively.**
3. **Keep in mind the "big picture"—see the whole forest, not just your particular tree. Don't fall into the trap of a specialist who "knows more and more about less and less."**
4. **"Accentuate the positive" in your thinking and in your action. Don't be defensive either about your work or about your particular qualifications.**
5. **See that your practice of management is in line with your fundamental belief in good team play and effective group action.**
6. **Get acquainted with yourself. If you would know others, you must first know yourself.**

the necessary philosophy. Likewise, many companies, which have attempted to do something formal about the development of their management personnel, have failed to define or even think through the objectives of whatever they are setting out to do.

A great many even formally-defined and stated objectives or purposes of executive development activities are inadequate or severely limited in scope. A little time spent in clarifying such objectives and in making them generally known throughout the organization would be well justified by larger returns from such activities.

Putting the Philosophy to Work. Even well-crystallized beliefs and stated objectives will not, in themselves, provide a sufficient guide for all managers at all levels and all locations—there must be some means to put the philosophy to work. Therefore the following steps or phases of putting an effective management development philosophy to work within the organization are proposed:

1. A broad statement of policy to crystallize the philosophy and synthesize determined objectives.

2. Certain procedures and tools to implement this policy. Three basic tools are of prime importance: an individual experience record; a performance appraisal or review procedure; and a specific plan or program for each individual.

3. Participation by top management.

4. Provision for application within the entire management team.

5. Identification and use of available management-development resources.

6. Almost unlimited subject-matter coverage.

7. Provision for continuous, long-term action, with feed-back controls to assure such continuity.

The Role of Middle Management. During the last few years, much concerning top management and front-line or supervisory management has been heard and read. Very little has been written or spoken about the several levels or layers of management responsibility which lie between top, general company management and management at the work level.

Middle management can best be defined by exclusion—by excluding those few individuals who have interfunctional, company-wide responsibilities and those who have immediate and direct supervision of work being done at any location or within any function.

This leaves the individuals involved in the several levels of management who, in most companies, are responsible for particular functions, locations, facilities, or products (things).

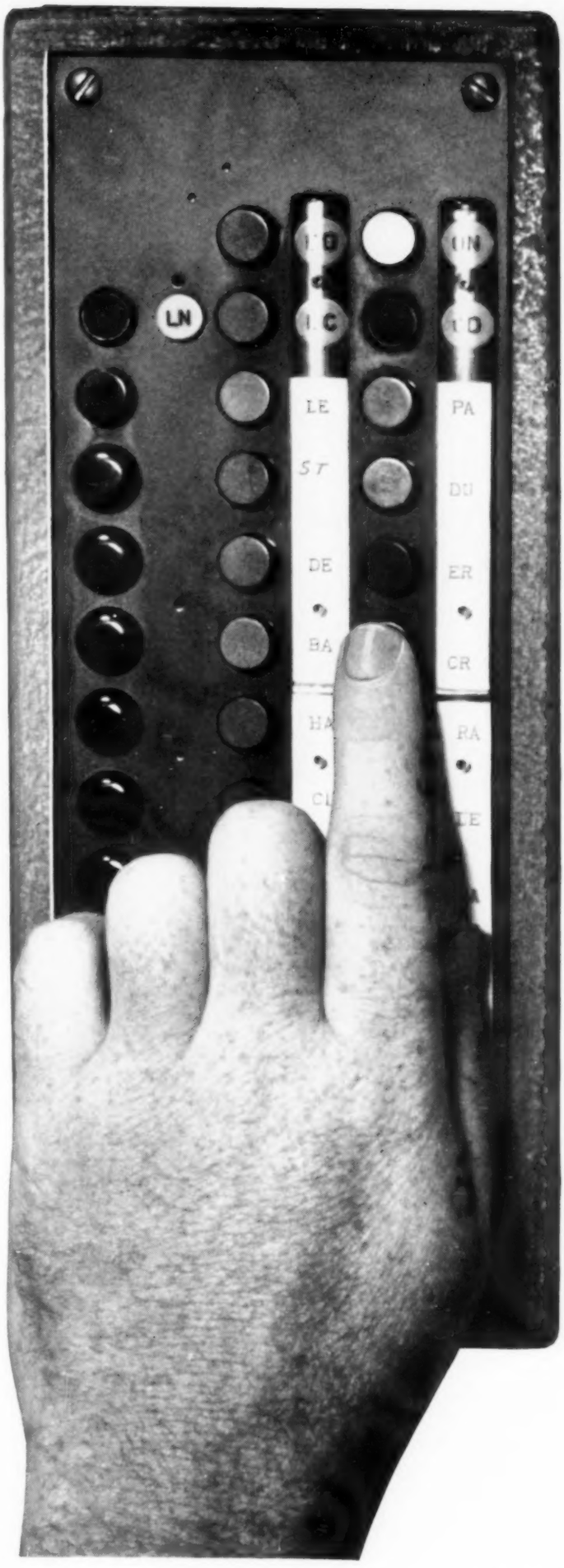
The "forgotten men" in management. A few years ago it was quite fashionable to refer to the foreman, the first-line supervisor, as "the forgotten man" in management, but since that time a variety of foreman training activities has developed.

In a relatively minor number of instances, companies have begun to recognize that more is needed in developing an effective organization than foreman or supervisory training. Frequently, the chief things wrong with the foremen's attitudes and behavior were the foremen's foremen—middle management.

The diminution of real authority at the working level and the creation of a wide variety of staff experts have served to augment the fact that individuals in management who actually may need broadening, horizon-clarifying attention most are many of those in middle management.

For example, most progressive companies have given some consideration to the way the over-all organization structure of the company is set up, its basic divisional and departmental setup. Likewise, there has been frequent analysis and attention to areas of responsibility and lines of authority at the work level—usually dictated by the nature of the work processes.

There has, however, been relatively little attention to the problems of organization planning within the several levels of responsibility which here are called middle management. A part of this neglect is reflected in the lack of developmental activities which are carried on within this group. This runs the gamut from membership in professional societies and attendance



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at management meetings (well-used by members of top management) to specific developmental and improvement classes for supervisors (most frequent at the lowest level). Yet, management development cannot be genuinely effective within an organization unless the essential interlocutory role of middle management is recognized and utilized.

Of course the developmental role cannot effectively be played either up or down, unless executives are willing first to look to their own development.

Dr. Ohmann of the Standard Oil Company of Ohio and one of the country's authorities in this field of personal development has put this point succinctly: ". . . emphasis in . . . training has usually been on training the other fellow—his needs and shortcomings being more apparent than our own . . . Let's start management development with ourselves. Certainly, we have some responsibility for developing others, but I sometimes think we could accomplish more if we just worked on ourselves."

Personal Development. Earlier it was emphasized that management development is man development and that each man, each individual, must want to develop. Actually, it is almost a phycho-physical truism that growth and development of an individual must continue; when growth process and growth desire stop, degeneration, leading to decay and death, begins.

Of course, there are many facets of a being in which the apex in this growth curve is reached relatively early, particularly true of the physical side of life. There are some old wives' tales which indicate that this same phenomenon is true regarding the mental-emotional side of life. A you-can't-teach-an-old-dog-new-tricks philosophy has handicapped the personal development of many in business. Not only does it keep some bosses from giving developmental attention to certain of their subordinates, but it keeps many individuals from doing anything for themselves.

This myth should and must be exploded. A person can grow, and develop and change, in attitude and in behavior, just about as long as he really wants to do so and in the general direction he basically picks out. In fact, it might be said that a person is going to change and develop for better or for worse anyway, so it behooves him to make this change as positive, as purposeful and as useful as possible.

Self-Analysis for Self-Development: The writer believes that all that is done in appraisal or performance review activities is aimed at helping the individual to see himself and thus to help himself. Thus, part of the process of coaching and counselling which goes on between boss and subordinate involves getting each man to appraise himself. If each person can say, "Yes, I should improve or change that aspect of my performance . . . What can I do about it?", then real development is well on the way.

Six Keys to Personal Development. At this point the reader may well ask: "So what? What do I do next about my personal development?" Here are six keys to follow:

1. Begin now to recognize your chosen profession of management. Such recognition implies a keeping up in your profession. There are evolving philosophies and procedures and techniques with which a bona fide professional manager must be familiar; he gets familiar by participating in management societies and programs and by reading widely, though selectively, in the field of management.

2. Look to your personal development on a continuing basis. This includes your ability to write and speak effectively. There is a growing feeling among many top executives that no one should be permitted to play an important role in management unless he is an effective speaker and writer.

Part of this, naturally, involves how and what you read. It has been well-stated, again and again, that the real leaders in tomorrow's business must be "well-educated men, not trained seals."

If you can't read rapidly enough, expose yourself to some of the techniques in written material and in evening classes on how to speed up your reading and improve your comprehension.

3. Keep in mind the big picture—see the whole forest, not just your particular tree. Don't fall into the trap of a specialist who knows more and more about less and less. Don't lose sight of the over-all objective of your organization. Constantly keep your personal and functional objectives in line with these over-all purposes.

4. Be positive in your thinking and in your actions. Don't be defensive either about your work or about your particular qualifications. Many functional specialists tend to want to defend their particular activity. Remember, "knowledge is power" and if your knowledge is broad enough, your power and recognition also will be broad.

5. See that your practice of management with your subordinates and others in the organization is in line with your fundamental belief in good team play and effective group action. Thus, don't precipitate line-staff conflicts.

If in a staff position, remember that the basic purpose of your function is to facilitate, to improve, to assist, to service, and to advise those individuals who are engaged directly in achieving the basic objectives for which the organization exists. Staff executives with this cooperative point of view do not grasp for line authority or complain that they need more authority to get the job done.

If you are in a line job, recognize that staff people are there to facilitate your activities, in the final analysis, and that your results can be sounder, quicker, easier through the proper use of staff assistance. An effective line executive knows how to use staff organization.

6. Get acquainted with yourself. If you would know others, you must first know yourself. This is not to advocate a morbid introspection; it is to advocate a mature, balanced outlook.

To make a good manager, begin with a good man, and each man must start this management development himself.

As previously emphasized—management development is really self-development. Only through individual self-recognition and development can management leadership be provided in business which is genuinely able to get things done through people.

ACKNOWLEDGMENT

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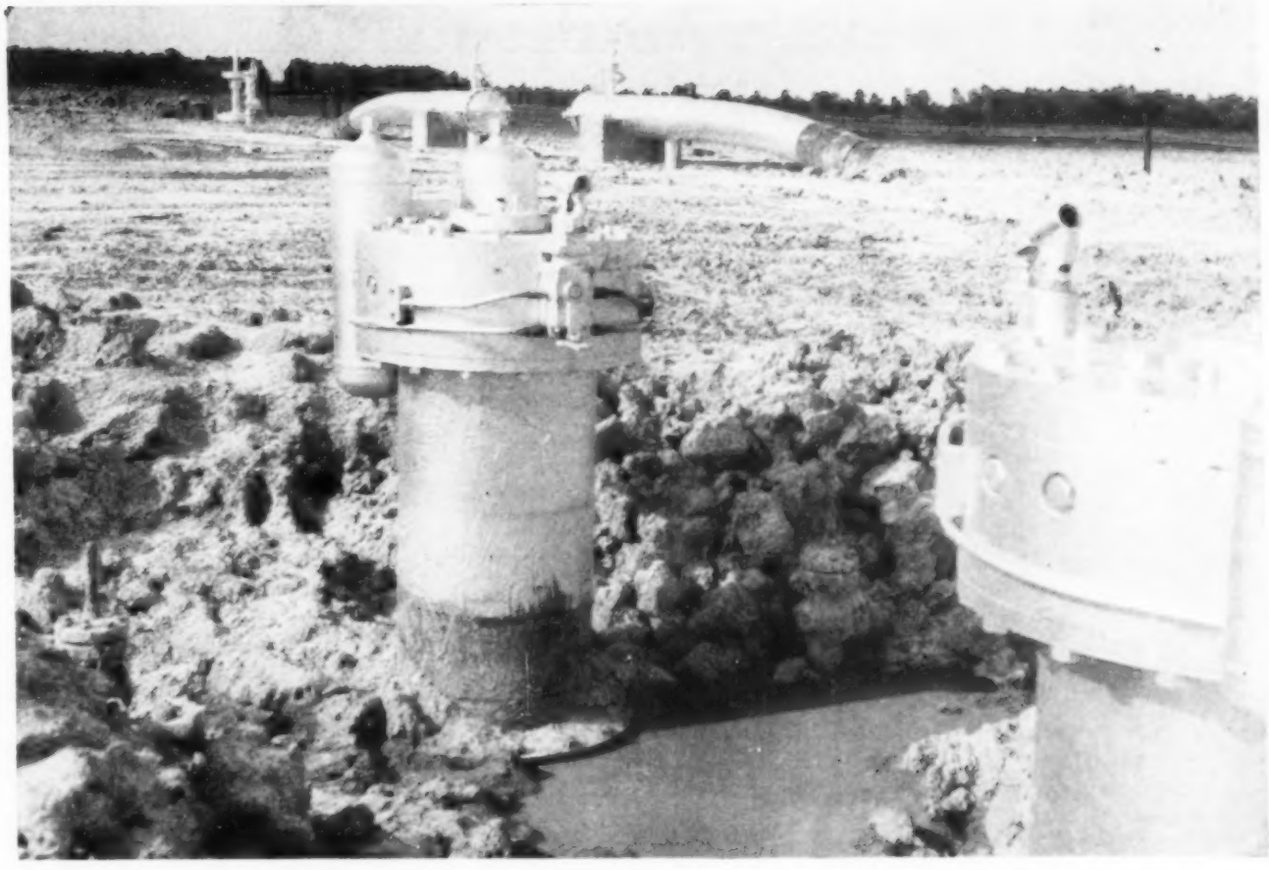

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El Paso Natural-Pacific Northwest Merger Builds New Gas Plant

El Paso Natural Gas Company and Pacific Northwest Pipeline Corporation have made an agreement for the acquisition by El Paso Natural of Pacific Northwest and its newly-completed 1471 mile natural gas transmission line, making El Paso Natural one of the largest transmission systems in the U. S.

Under the proposed plan, seven shares of El Paso common stock would be given to Pacific Northwest stockholders in exchange for eight shares of stock in Pacific Northwest. The offer, subject to approval of El Paso Natural stockholders, will be considered at a special meeting December 21. It is expected that the offer of exchange will be made to Pacific Northwest stockholders about January 15, 1957.

Heads of the two companies stated that the proposed merger would result in more efficient utilization of gas resources and more effective service to customers of both companies.

Under the merger of the two systems, Canadian gas from British Columbia and Alberta, supplemented by San Juan reserves, can be transported to the California markets of El Paso Natural.

El Paso's pipe line system supplies customers in Texas, New Mexico, Arizona and California. Pacific Northwest's line extends from the San Juan Basin in New Mexico and Colorado to the Canadian boundary in Washington. During the first year, the new line is to deliver 350 million cubic feet of gas daily from the San Juan Basin of New Mexico and other Rocky Mountain fields. It will also receive Canadian gas supplies at the international boundary in 1957 under an agreement with Westcoast Transmission Company Limited. The agreement provides for the importation of an initial 300 million cubic feet of gas per day from the Peace River fields in Alberta.

Pacific Northwest will continue to be operated as a separate corporation with headquarters in Salt Lake City and stockholders will have representation on the El Paso board approximately proportional to their ownership.

Line Progresses in Spite of Snow

Although smoke and steam cloud the snow-covered prairie from Alberta to eastern Canada, Trans-Canada Pipe Lines Ltd. moves along on its 34-inch natural gas line. Here coating and wrapping operations are underway. The ground on the right-of-way is frozen most of the day, except for two hours in midafternoon when the winter sun turns the right-of-way into mud. Pipeliners on the spread expect to continue work until sub-zero temperatures set in or heavy snowfall stops operations.

Conversion of Crude Line To LPG Service Underway

A Gulf Oil Corporation and Warren Petroleum Company program to convert an old crude line to LPG service is underway in Texas.

Panama Williams Corporation has begun work on a 46-mile 10-inch line from Gulf's Waddell plant in Crane County, to Midland, Texas. At Midland the new line will tie into an existing line formerly used by Gulf to transport crude oil.

An 8 and 10-inch line from Midland to Lufkin will be converted to handle liquefied petroleum products and 116 miles of 10-inch line will be built south from Lufkin to the terminal at Barbers Hill on the Gulf Coast where storage facilities are under construction.

A gathering system of 6 and 8-inch lines will tap products from a Warren Petroleum line in West Texas and from natural gasoline plants in southeast New Mexico. Gulf Refining will operate the pipe line.

Clevelands dig through swamps and hills for 327-mile 18" products line in working space only 35' wide

Oklahoma Pipe Line Constructors are cashing in on the compact design, reversible discharge conveyors and rugged digging ability of their Cleveland trenchers in the construction of this 18" products line for the Plantation Pipe Line Company. Construction operations are restricted to a working space only 35 feet wide because pipe is being laid alongside existing 12 and 18" lines under load in the original right-of-way. Two Clevelands are being used to cut trench 42 to 54 inches deep for the 327-mile line extending through swamps and rolling hills from Baton Rouge, La. to Helena, Ala., near Birmingham.

• The Cleveland 240, shown above, is only 8-feet wide over its non-packing, bearing-sealed crawlers—a perfectly balanced, powerful trencher that easily negotiates the wettest rights-of-way and overcomes the toughest hills—digs up to 3 feet in width and down to 6 feet, 3 inches in depth.

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North Sea-to-Ruhr Line Approved

A nine company group has approved a proposal to build a 200-mile large diameter crude pipe line from Wilhelmshaven on the North Sea to the Ruhr area of West Germany.

Scheduled for 1959 completion, the line will be of 28-inch and will initially carry about 180,000 barrels daily to be boosted to 400,000 barrels by 1965.

North-West Oil Pipelines Company has been formed by six West German refiners, headed by affiliates of Standard Oil Company (N. J.) and British Petroleum Company, Ltd., to build the proposed $46.2 million line.

An alternate project from the port of Rotterdam to the Ruhr was under consideration until recently. The West German government will contribute $8½ million to the dredging of the Wilhelmshaven Harbor to 44-foot depths to accommodate supertankers.

Approval of the new line is expected to stimulate refinery construction in the Cologne area where several projects including a refinery to be built by Deutsche Purfina have been announced.

Work on Crude Line Begins on Caribbean Coast

Right-of-way clearing has begun in Venezuela on a 212.5 mile 20-inch pipe line to carry crude from the Barinas-Apure basin to Puerto Cabello on the Caribbean coast. Williams Brothers has been awarded the contract to build the line for Socony Mobil Oil Company de Venezuela.

Actual pipe laying operations will begin the last of December with completion of the line expected in July, 1957. The line will have an initial capacity of 110,000 barrels daily with a potential capacity of 165,000 to 170,000 barrels per day.

Williams Brothers will have a single spread constructing the line, but the spread will be supplemented by a double jointing crew operating ahead of the line.

Ohio Fuel Gas Receives OK for Gas Facilities

The Ohio Fuel Gas Company has received Federal Power Commission authorization to construct and operate natural gas facilities in Ohio costing $772,360.

Facilities include 19 miles of 5, 12, and 16-inch pipe line replacing or looping existing facilities to serve increased requirements of markets in the Dayton and Toledo areas, and extension of service to McCutchenville. Ohio Fuel Gas will abandon 8 miles of pipe which the authorized construction will replace.

Temporary authority was granted for Ohio Fuel Gas to construct additions to its Crawford, Ohio, compressor station. Estimated to cost $850,000, the facilities will include two additional 1500 horsepower compressor units.

Westspur to Extend System in Saskatchewan

Westspur Pipe Line Company has applied to the Federal Board of Transport Commissioners for permission to extend its present crude oil gathering and transportation system in southeastern Saskatchewan.

The proposed expansion would include construction of 20 miles of 12-inch line from Alida to the Carnduff-Glen Ewen area to gather crude from the Cantal, Hastings, Florence, Carnduff and Glen-Ewen fields. In addition to the main line the extension would include 34 miles of 4, 6 and 8-inch gathering lines in these fields.

If the proposed extension is granted, initial capacity of the system would be sufficient to meet present production sales from the areas. It could be increased to a throughput in excess of 60,000 barrels daily.

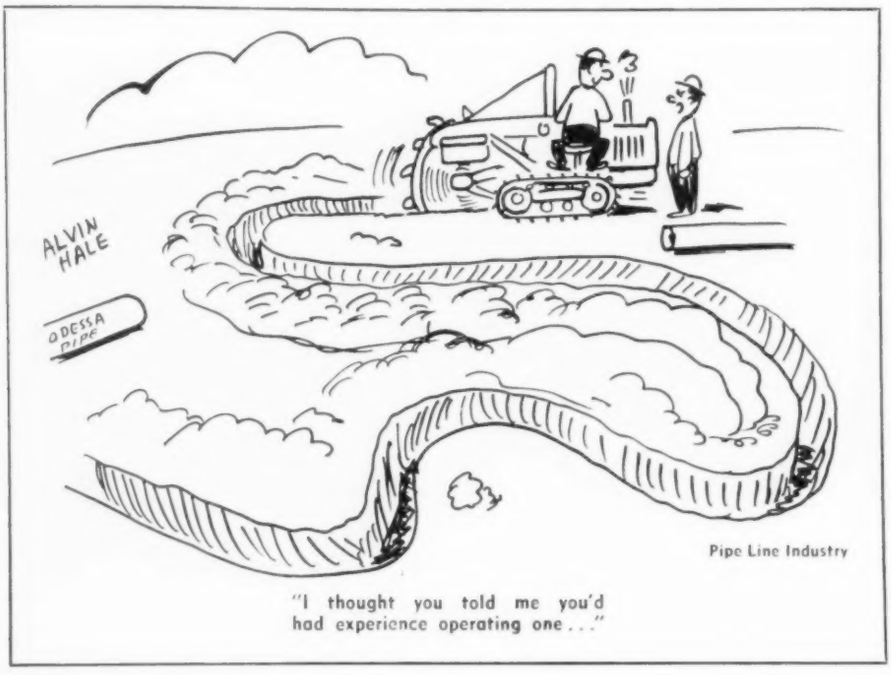
Sun Pipe Line Completes 109-Mile Products Line

Sun Pipe Line Company's 109-mile 14-inch pipe line which delivers 3½ million gallons of gasoline daily to bulk storage at Newark, N. J. is now in operation.

Costing $6 million, the pipe line begins at Twin Oaks, Pa., near Marcus Hook and ends at Sun's marine and land terminal at Newark where a half million dollar expansion and modernization program is underway.

Capacity of the new line is double that of the one it replaces although only one pump station is being used. Initial maximum line capacity is 83,000 barrels a day while pumping gasoline and 65,000 barrels a day while pumping furnace oil.

Construction began in May. The line follows for the most part the old right-of-way and makes four river crossings.



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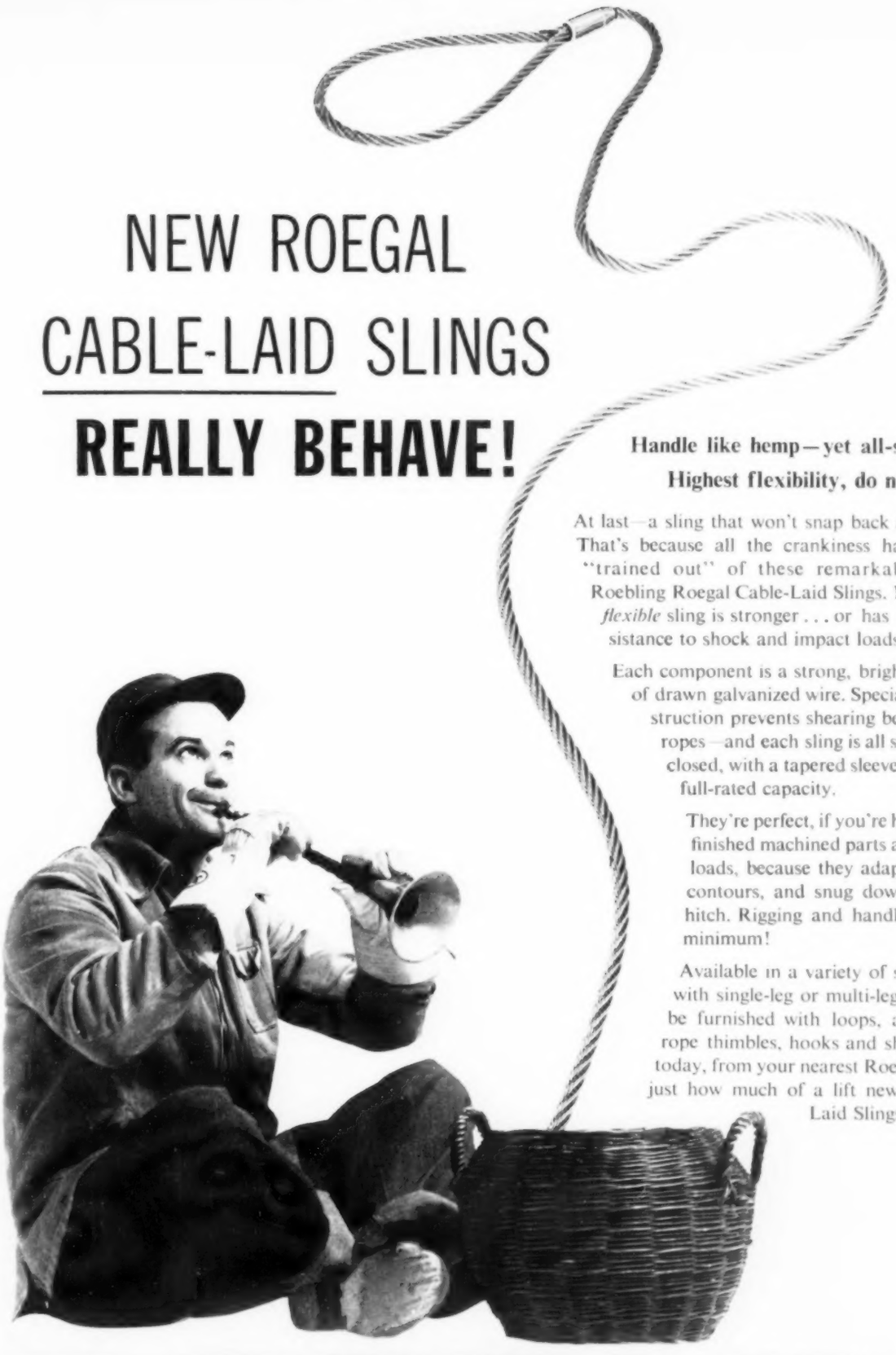

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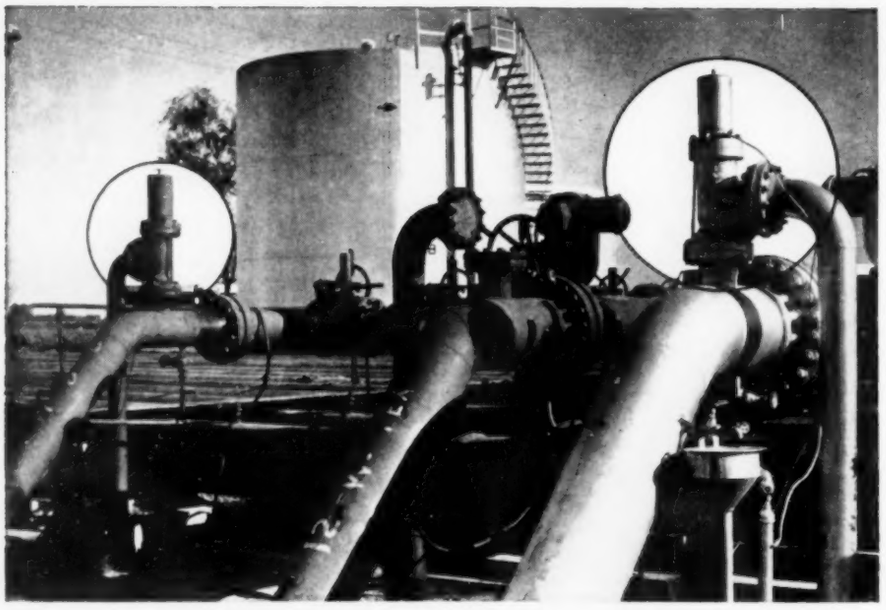

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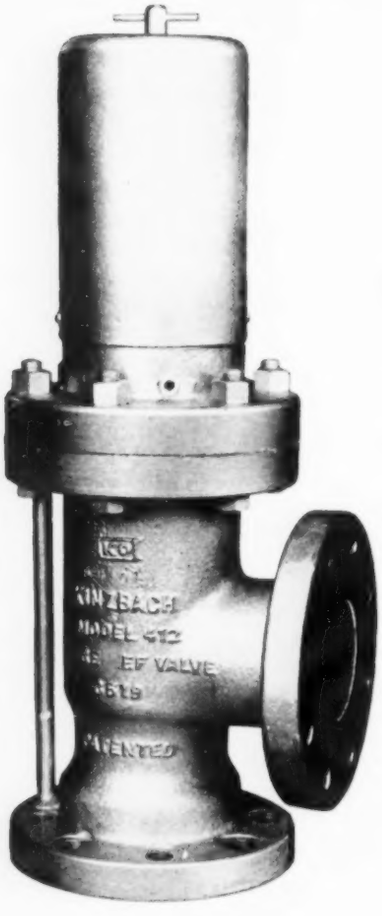

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Construction to Begin On Venezuelan Gas Line

The Venezuelan government's Institute of Petrochemistry of the Ministry of Mines and Hydrocarbons has awarded contracts for a 230-mile 26-inch gas pipe line from Anaco to Caracas.

A joint venture group composed of Contuca, owned by Fulghum Contracting, and Petrogas will construct the main line.

An 80-mile 20-inch line will extend from Caracas to Valencia and several hundred miles of distribution lines are planned in Caracas.

The 26-inch main line, estimated to cost approximately $30 million, will cross mountain country and will supply industrial plants in the area, including the government's Mariposa power plant.

Other pipe line projects announced previously in the country's nationwide gas distribution network include an extension from Valencia to Moron, and a line from Moron to Cardon on the Paraguana peninsula.

FPC Approves Gas Facilities For Texas Gas Transmission

Texas Gas Transmission Corporation has received temporary authorization from the Federal Power Commission to build and operate $1.5 million in natural gas facilities in Louisiana.

Texas Gas proposes 13 miles of 20-inch pipe line from the end of its East Lake Palourde 20-inch line in Assumption parish to the Thibodaux area, LaFourche parish together with a gas purchase meter station in the Thibodaux area.

Cities Service Gas Company To Build Oklahoma Facilities

The Federal Power Commission has granted temporary authority to Cities Service Gas Company to build and operate $1.4 million in natural gas facilities in Oklahoma.

The proposed construction consists of 11 miles of 30-inch pipe line to replace an existing 20-inch line; 17 miles of 20-inch loop line in Logan County; and the addition of turbocharging equipment to two 1100 horsepower compressor units in its Edmond station in Oklahoma County to add 250 horsepower to each unit.

For effective, long-term protection against corrosion . . .

Close-up of Transhield Asbestos Pipe Line Felt, showing parallel-spaced glass yarns.

Coating and wrapping pipe line to check corrosion and assure long-term service.

. . . use Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

Johns-Manville Transhield is an economical pipe line felt assuring effective, long-term protection against corrosion under average soil conditions.

Designed for easy, high-speed application by modern machine methods, Transhield is strong and highly tear-resistant. Its light weight permits its use in 800-ft. rolls. This advantage cuts roll changes in half for field wrapping equipment.

Transhield provides a protective membrane of coal-tar saturated asbestos felt, reinforced with continuous glass yarns parallel-spaced on ¼" centers. It cannot rot or decay, thus acts as an enduring barrier to shield pipe line enamels from earth loads and soil stress.

For severe soil conditions use Johns-Manville #15 Asbestos Pipe Line felt . . . proven in service for over 30 years.

For further information about Transhield, write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, 565 Lakeshore Road East, Port Credit, Ont.

Johns-Manville PRODUCTS FOR PIPE LINE PROTECTION

Pacific Gas and Electric Line Underway in Sacramento Valley

Work is underway on an 83-mile $5.3 million pipe line for Pacific Gas and Electric Company from the Beehive Bend field near Willows into the Sacramento area in California.

Engineers Limited Pipeline Company has the main contract for pipe line installation. Completion is scheduled for next summer.

The first 37 miles will be of 18-inch diameter pipe, the next 37 miles of 20-inch and 16-inch pipe from Davis to Sacramento. The line, which completes a loop around the Sacramento Valley, will bring up to 40 million more cubic feet of natural gas daily into the area.

Construction on the first 38-mile section from Gilroy to Milpitas nears completion and ground preparations are underway for a 25-mile section farther south as PG&E's $10 million expansion of the Super Inch natural gas main nears its half-way point.

A total of 85 miles of 34-inch pipe is being laid along three sections of the 502-mile route from the Arizona border to Milpitas. The job, including compressor station capacities increases, is scheduled for completion early next year.

Ohio Oil to Construct Products Line in Illinois

The Ohio Oil Company has announced plans to construct a common carrier products pipe line from Wood River, Ill., to Chicago.

The new refined products line will make additional space available to move products directly from the Mid-Continent area to Chicago. With an ultimate capacity of 90,000 to 100,000 barrels per day, the line will alleviate the bottleneck through the Alton, Ill., locks during low water periods in the Mississippi and Illinois rivers.

Ohio also has announced plans to lay a connecting pipe line from its refinery at Robinson into the new Wood River-to-Chicago line.

Contracts Awarded On Texas Eastern Line

Contracts have been awarded on Texas Eastern Transmission Corporation's 422-mile 30-inch pipe line from McAllen to Beaumont, Texas. This line will connect Texas Eastern's system with a line being built by Petroleos Mexicanos to the international boundary.

Three sections of the line in South Texas totaling 203 miles will be built by H. B. Zachry Company. H. C. Price Co. will handle a 71 mile spread near Corpus Christi and Houston Contracting Company has two sections totaling 121 miles from Angleton to Vidor, Texas.

Grayco Constructors Inc. has begun construction on a 48-mile 24-inch lateral from Blessing to Provident City, Texas, and construction is underway. Pentzien Inc. will build five river crossings on the line.

Western Pipe Line Inc. will build three 30-inch bay crosings on the line at Nueces, Lavaca and Carancahua bays. Missouri Valley Dredging Co. will build Hinds and Guadalupe Bay crossings.

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True power hydraulic controls and greater usable horsepower make these LS-88 machines the

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ON River Construction Corp.'s spread near Jackson, Texas, everyone agrees their 9th and 10th Link-Belt Speeders (two LS-88 hoes) move out more rock and caliche than any other ¾-yd. hoes they've seen.

Delivering 88 usable horsepower, these LS-88's really sock the bucket into the trench—fill it fast, first pass. Fast, positive and easy-to-operate power hydraulic controls, plus greater usable horsepower, do the trick.

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Like all Link-Belt Speeders, the LS-88 takes full advantage of all the power its engine was designed to produce—in some cases up to 30% more than the same make and model engine develops when used in other shovel-cranes.

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DITCH FOREMAN "TEX" MERIDA (left) reports, "They dig good in either mud or rock and walk fast on the road." OPERATOR BOB CLAUNCH, JR. (right), adds, "The LS-88 is simple to operate and is the diggingest rig I ever sat on!"

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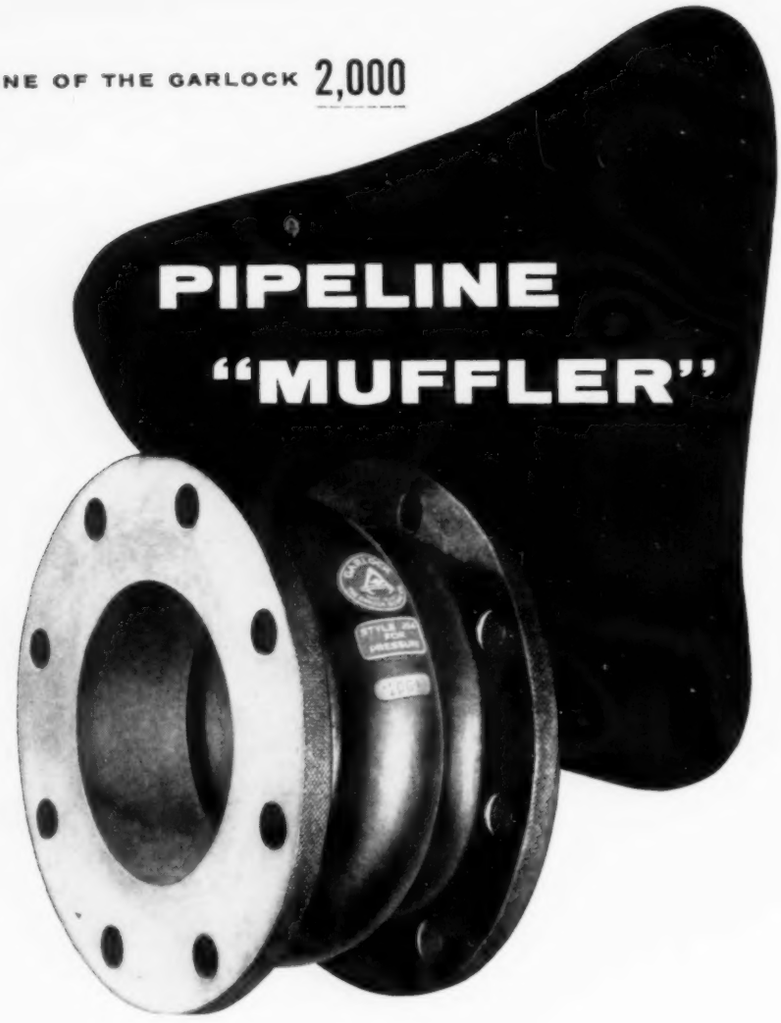

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Southern Natural Gas Plans New Facilities in Louisiana

Southern Natural Gas Company has requested Federal Power Comission approval for the installation o new pipe lines, and compressor an measurement facilities to connec three gas fields in LaFourche Parish La., to the company's South Louisi ana supply system.

Plans also include installation of new 1100-horsepower compressor sta tion on the South Louisiana west le and for supercharging one of th Gwinville compressor station engines

The three new fields, Lake En fermer, East Golden Meadow an King's Ridge, are approximately 2 miles southwest of the point wher the company's Barataria line crosses the Mississippi River.

The new facilities will include 2 miles of 12-inch line from the west Mississippi River header of the Barataria line. The Lake Enfermer field will be connected with the 12-inch line by 2½ miles of 10-inch pipe, while the other fields will be tied into the 12-inch line with 2 miles of 8-inch line.

At Gwinville, the compressor horsepower will be increased and a 1100-horsepower compressor station will be constructed near White Castle, La.

Permian Basin's New Station In Operation in Texas

Permian Basin Pipeline Company has placed its Andrews County compressor station in operation. The first five 1350-horsepower units are in operation and work is underway on five more units to boost the station's compressor capacity to 13,500 horsepower. A dehydration plant also is in service.

Construction began in April by Gasoline Plant Construction Corporation of Houston. A second certification by the Federal Power Commission permitted doubling the number of compressor engines and increasing daily deliveries from 25 to 50 million cubic feet.

Permian has a contract to receive gas from Phillips Petroleum Company to supply Northern Natural Gas Company, Permian's parent company, for delivery in the northern plains market area.

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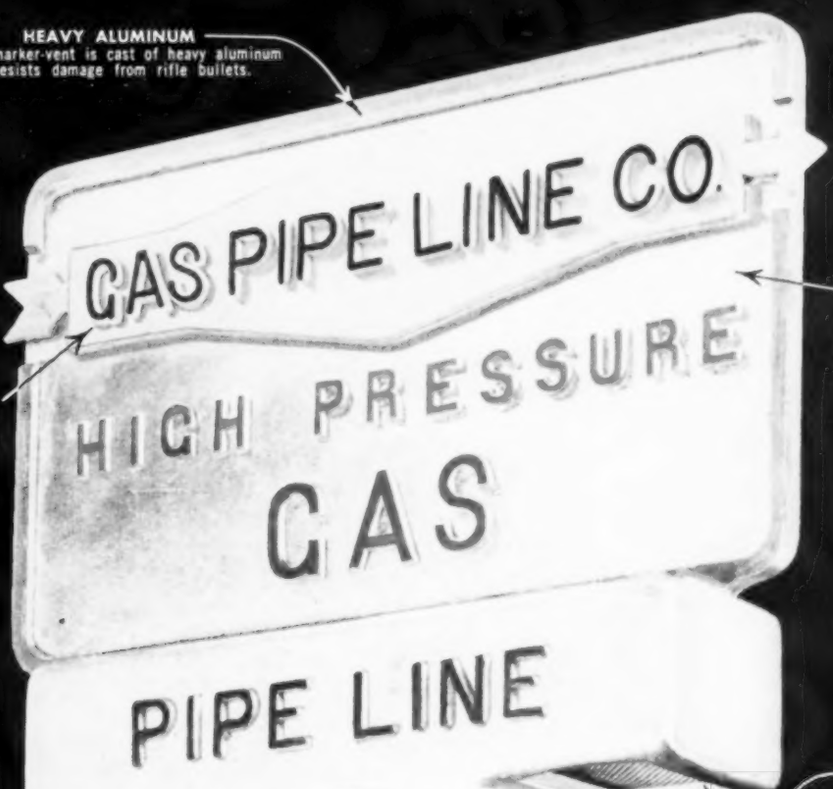

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Proposed Pipe Line Construction

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alberta Gas Trunk Line Ltd.	547	6-34	Gas	From Alberta fields to western terminus of Trans Canada Pipe Line, Ltd.	$47 million	Approved
Andes Pipeline Corp.	500	12	Gas	From Villamontes, Bolivia, across Andes to Antofagasta, Chile	$30 million	Planned
Bolivian Gulf Oil Co.	201	8-10	Crude	Sicasica, Bolivia to Arica, Chile	$10.5 million	Planned
British Petroleum Company		16	Crude	Popton Point, South Wales, to Llandarcy refinery	$14 million	Considered
Chaco Pipeline & Refinery Corp.	450	....	Products	From Glenn McCarthy's Bolivian wells to new refinery at Conception, Paraguay	.....	Planned
Cities Service Gas Co.	35	6, 12, 16	Gas	Facilities in Kansas, Missouri, and Oklahoma	$2.8 million	Authorized
	28	20-30	Gas	Facilities in Oklahoma	$1.4 million	Authorized
Coastal Transmission Corp.—Houston, Texas	595	20-26	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas, plus 272 miles of laterals	$68 million	Before FPC
Colorado Interstate Gas Co., Colorado Springs, Colo.	734	22-34	Gas	Texas & Oklahoma Panhandle to Kit Carson, Colo., to Beatrice, Neb.	$87 million	Before FPC
	36	26	Gas	East Denver to South Denver station and loop of Portland lateral	$1.3 million	Authorized
Compania Shell de Venezuela	177	20	Gas	La Paz field to Cardon refinery on Paraguana peninsula	$20 million	Planned
Consolidated Gathering Systems, Ltd.	108	....	Crude	Sturgeon Field—Edmonton	.....	Planned
Creole Petroleum Corp.	94	28	Crude	Temblador to Caripito, Venezuela	$5.6 million	Planned
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border	.....	Planned
El Paso Natural Gas Co.	888	....	Gas	Facilities in Texas, New Mexico, and Arizona to deliver gas near Blythe, Calif. and Topock, Ariz. to So. Counties Gas Co., So. Calif. Gas Co. and Pacific Gas & Electric Co.	$84.5 million	Before FPC
	108	....	Gas & Products	Facilities in Andrews and Ector Counties, Texas	$5 million	Authorized
	28	10	Gas	Nolan and Coke Counties, Texas, plus compressor station facilities	$1 million	Authorized
El Paso Natural Gas Products Co.	240	8	Products	Midkiff natural gasoline plant in Permian Basin to El Paso	.....	Planned
Houston Texas Gas & Oil Co.—4604 Main St., Houston	961	12-30	Gas	Baton Rouge, La. to Miami, Fla. plus 496 miles of laterals and compressor facilities	$105 million	Before FPC
International Petroleum Co.	180	....	Crude	Pasto, Colombia, to Pacific port of Tumaco	.....	Considered
Interprovincial Pipe Line Co.	150	20	Crude	Sarnia, Ont. to Toronto, Ont.	.....	Planned
Interstate Oil Pipe Line Co.	55	8	Crude	Billings, Mont. to Wolf Springs, Mont.	.....	Considered
Iraq Petroleum Co.	1,200	38-40	Crude	Kuwait to Iskenderun, Turkey	.....	Considered
Iron Ranges Natural Gas Co.	115	....	Gas	From Itasca and St. Louis Counties along route of Mesabi range from Grand Rapids to Aurora, Minn.	$5 million	Before FPC
Iroquois Gas Corp.—Buffalo, N.Y.	36	....	Gas	Facilities in Chautauqua, Cattaraugus and Erie counties, N.Y. to develop new underground storage area for natural gas	$2.8 million	Authorized
Israel Government	70	6	Products	Haifa to Tel Aviv	$1 million	Planned
Kansas-Nebraska Natural Gas Co.	32	....	Gas	Facilities in Nebraska	$4 million	Authorized
	62	....	Gas	Gathering line and measuring facilities from Camerich field, Okla. to Northern Natural Gas Co.'s Liberal, Kansas, station.	$1.4 million	Before FPC
Lone Star Gas Co. Dallas	230	22-26	Gas	Cotton County, Okla. to Fritch, Texas	$18.7 million	Before FPC
Magna Pipeline Company	40	....	Gas	Underwater line from Anacortes, Wash. to Victoria, B.C.	$6 million	Planned
Mene Grande Oil Co.	62	30	Crude	Anaco to Puerto La Cruz, Venezuela	$5.8 million	Considered
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	472	4-24	Gas	Main line loops and extensions in Wisconsin, Illinois	$17.6 million	Before FPC
	252	....	Gas	Loops in Missouri, Iowa, Wisconsin and Illinois	.....	Contracts let for 228 miles
Midwestern Gas Transmission Co., Houston, Texas	1112	....	Gas	Emerson, Manitoba—Nashville, Tenn.	$98 million	Before FPC
Mountain Fuel Supply Company	38	20	Gas	Parallel line and facilities to transport gas from Pacific Northwest line in Sweetwater County, Wyo.	$3 million	Authorized
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors, 1330 miles let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Before FPC
	25	....	Gas	Quinduno field in Roberts County, Texas	$3.2 million	Authorized
	416	36	Gas	Loops at various points along existing line	$76.2 million	Before FPC
New York State Natural Gas Corp.	27	....	Gas	Elk County, Penn. to Luthersburg gas field in Clearfield, Jefferson and Indiana Counties, Penn.	$1.5 million	Authorized
North Carolina Natural Gas Corp.	575	3-16	Gas	Mooresville eastwardly across North Carolina	$13 million	Authorized
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	42	10	Gas	Rochester, Minn. to Winona and Goodview, Minn.	$963,000	Before FPC
North-West Pipelines Co.	200	....	Crude	Wilhelmshaven on North Sea to Ruhr area of Germany	$46 million	Approved
Northwest Pipeline Corp.	350	6-10	Crude & Products	Four Corners area to Salt Lake City, Utah	$15 million	Planned
Offshore Gathering Corp., Houston	364	24, 26, 30	Gas, Crude	Texas side of Sabine River 25 miles offshore La. to Mississippi side of Pearl River	$150 million	Planned
Ohio Fuel Gas Co., Columbus	19	6-16	Gas	Loops on existing line to serve Dayton and Toledo areas and extension to McCutchenville, Ohio	$772,360	Authorized
Ohio Oil Company, Findlay, O.	....	....	Products	Wood River, Ill. to Chicago	.....	Planned
Oklahoma Natural Gas Co., Tulsa	16	8	Gas	Connect gas supplies in Gotebo field, Okla., to Clinton System in Western Okla.	$350,000	Planned
Pacific Gas & Electric Co.	150	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$20 million	85 miles let
	83	12, 18, 20	Gas	Glenn County areas to Sacramento region	$5 million	Contract let
	200	12	Gas	Northern California gas fields to Humboldt County, California	$9.5 million	Planned
Pacific Northwest Pipe Line Corp.—Salt Lake City, Utah	50	4-6	Gas	To serve industrial customers at Uravan and Nucla, Colo.	$1 million	Authorized
Pembina Pipe Line, Ltd.	100	....	Crude	Gathering line and new pumping unit in West-Central Alberta	$4.5 million	Planned
Pennsylvania Gas Co.	38	8, 10	Gas	In Erie and Warren Counties, Penn., and Chautauqua County, N.Y.	$930,000	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	80	8	Products	Guaymas—Los Mochis	$1 million	Planned
Piedmont Gas Co.—Hickory, N.C.	78	2-8	Gas	From connection with Transcontinental Gas Pipe Line to serve customers in North Carolina	$2.6 million	Before FPC
Saskatchewan Power Corp.	80	....	Gas	Hatton gas field to Success, Sask.	.....	Planned
	40	....	Gas	Moose Jaw, Sask. to Regina, Sask.	.....	Planned
Scranton-Spring Brook Water Service Co.	37	12	Gas	Hebron-Greenwich facilities of Tennessee to Scranton and Wilkes-Barre, Pa.	$1.6 million	Before FPC
Service Pipe Line Corp., Continental Pipe Line Co., Sinclair Pipe Line Co. and Phillips Petroleum Co.	....	....	Products	Salt Lake City to Spokane, Wash.	.....	Considered
Shell Oil Company and Standard Oil Co. of California	600	14	Crude	Four Corners area to Los Angeles area	.....	Considered
Sinclair Oil Refining Co. and Socony Mobil Oil Co.	211	....	Crude	San Silvestre field, Barinas, Venezuela, to Puerto Cabello on Caribbean sea coast	$25 million	Contract let
South Alberta Pipe Line, Ltd.	46	10	Gas	Etzikom Field—Medicine Hat, Alberta	$1 million	Planned
South Saskatchewan Pipe Line Company	58	12	Crude	Cantuar field to Dollard field, Saskatchewan	$3 million	Contract let
Southern Natural Gas Company	52	....	Gas	Various locations in Ga. and La.	$2.2 million	Authorized
	28	8-12	Gas	Connect 3 gas fields to east leg of south La. supply system plus compressor station additions.	$2.9 million	Authorized
Southern Pacific Pipe Lines, Inc.	300	....	Products	From San Francisco Bay area to Reno—Fallon, Nev. area	$16 million	Approved
Stanmount Pipe Line Co.	140	10	Crude	Cayiga and Beaver Lake Fields, N.D. to connect with Interprovincial Pipe Line	.....	Planned
Sturgeon Pipe Line Ltd.	100	12	.....	Sturgeon Lake Field - Trans-Mountain system	$6.5 million	Planned
Trans-Europe Pipe Line	500	30	Crude	Mediterranean to northern Europe	.....	Considered

Help your spreads *stay on schedule*...

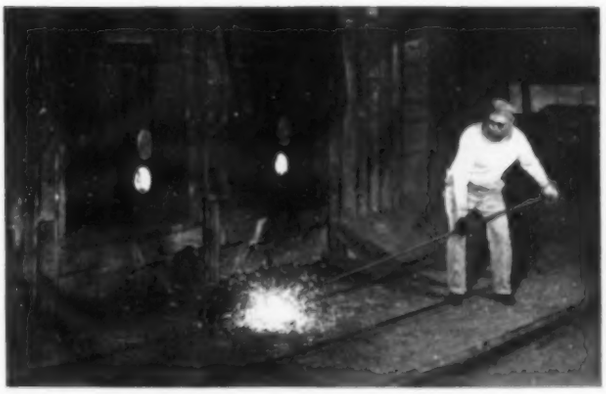
EQUIP THEM WITH DEPENDABLE, FAST-DIGGING BUCYRUS-ERIE DRAGSHOVELS

When you put sure-footed, high-output Bucyrus-Erie 15-B and 22-B dragshovels in the hands of experienced pipeliners, you've got a combination that's *geared to move on schedule.*

For the greater mobility needed by pipeliners, special mounting with tractor-type crawlers having deep grousers is available for these machines at extra cost. It provides the traction and mobility to cover rough terrain, enables these machines to climb grades up to 35 per cent, and to maneuver through swamps and mud. Clearance is high, too, for easy travel over rocks and obstacles — up to 16½ in. for the 15-B, and 20¾ in. for the 22-B.

A powerful digging stroke plus rapid hoist and swing produce consistently high output even in hard digging. Just as important is Bucyrus-Erie's traditionally sound and proved design that insures maximum working time and keeps maintenance to a minimum.

Your nearby Bucyrus-Erie distributor will give you the complete story on the dragshovels that experienced pipeliners depend on — the ½-yd. 15-B and ¾-yd. 22-B. See him soon. 237E56



Bonus Quality **Bucyrus-Erie leaves nothing to chance. This sample pouring from a furnace will be tested to insure that it measures up to the highest specifications. This testing is done with <u>all</u> steel used by Bucyrus-Erie — your assurance of the Bonus Quality that means money saved day after day, year after year.**

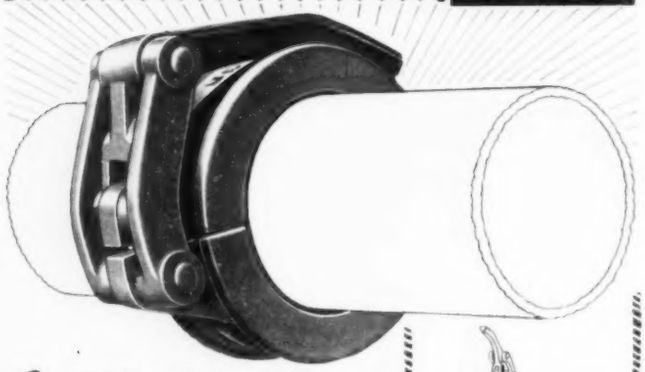
BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

Proposed Pipe Line Construction—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Tecumseh Pipeline Co.	190	20	Crude	To connect to principal crude line carriers in Chicago area for movement to east	.....	Planned
Tennessee Gas Transmission Co.—Box 2511, Houston (See also Midwestern Gas Transmission Co.)	100	...	Gas	Gathering lines in Texas and Louisiana plus station additions	$18.6 million	Before FPC
	1085	12-30	Gas	Southeast La. to Portland, Tenn.; from Kinder, La., to offshore wells in Gulf of Mexico; from Coudersport, Penn., to Hamburg, N.Y., and I oop lines in Ky., W. Va., Penn.; compressor stations in Miss., Tenn., N.Y., Penn.; and additions in Tenn., Ky., Ohio, and Penn.	$166 million	Before FPC
Texas Eastern Transmission Corp., Shreveport, La.	422	30	Gas	McAllen to Vidor, Texas	Estimated	Contracts let
	77	30	Gas	Loops at various points between Kosciusko, Miss. and Uniontown, Penn.	Cost of Entire Project	Authorized
	45	24	Gas	Provident City, Texas crossover to McAllen-Vidor line	$82.7	Contract let
	147	.....	.....	Supply and delivery lines laterals	Million	Authorized
Texas Gas Transmission Corp	40	6-30	Gas	Parallel lines and compressor additions on existing lines in Louisiana, Missouri, Mississippi, Illinois, Kentucky	$6 million	Authorized
	.....	.....	Gas	To deliver gas from four Louisiana gas fields to American Louisiana system.	$783,100	Authorized
	13	20	Gas	East Lake Palcurde line, Assumption Parish, to Thibodeux area, Lafourche Parish, plus metering facilities	$1.5 million	Authorized
Texas Illinois Natural Gas Pipeline Co., Chicago	38	36	Gas	Loops facilities in Illinois	$6.4 million	Authorized
Trans-Canada Pipe Line, Ltd—Calgary, Alberta	2250	30, 36	Gas	Alberta—Eastern Canada	$378 million	Contracts let for 4 spreads
Trans Carolina Pipeline Co.	280	8-18	Gas	Transmission line and compressor facilities plus 567 miles of laterals in tidewater areas of North and South Carolina	$21.6 million	Before FPC
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	...	.....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	.....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
	12	...	Gas	Live Oak gas field, Vermillion Parish, La. plus two meter stations	$707,000	Before FPC
Union Oil Co. of Calif.—Los Angeles, Calif.	225	12, 16	Crude & Products	San Joaquin Valley to Union Oil's Oleum refinery on San Francisco Bay.	.....	Planned
United Fuel Gas Co., Charleston, W.Va.	18	12	Gas	Coco compressor station in Kanawha County, W. Va., to Belle, W. Va.	$845,853	Authorized
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Washington Gas Light Co.—Washington, D.C.	28	20, 24	Gas	From metering station of Atlantic Seaboard Corp. to Washington to connect with line leading to District of Columbia facilities	$3.4 million	Authorized
Westcoast Transmission Company, Ltd., Calgary	270	8-26	Gas	Various locations in Peace River region	.....	Contracts let for 155 miles
Westspur Pipe Line Co.	20	12	Crude	Alida to Carnduff-Glen Ewen area of Saskatchewan plus 34 miles of gathering line	.....	Planned
Wilcox Trend Gathering System, Inc.	16	16	Gas	Gathering lines to Provident City, Texas	$2.9 million	Before FPC
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Yacimientos Petroliferos Fiscales	808	.....	Gas	Campo Duran, to Buenas Aires, Argentina	$76 million	Planned
	621	.....	Crude	Mendoza to San Lorenzo Argentina	$19 million	Planned
Yacimientos Petroliferos Fiscales Bolivia	86	...	Crude	Yacuiba to Bermejo, Bolivia	$3 million	Considered

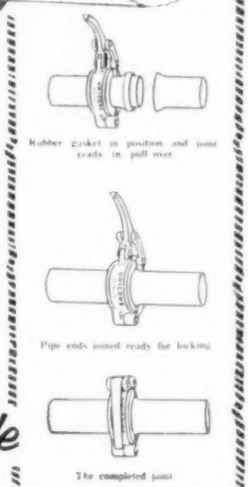
INSTANTANEOUS! JOINTS



A perfect seal in a matter of seconds

For temporary pipe lines 'Unicone' instantaneous joints are recommended. Comprising two parts only, they fasten with a "snap" ensuring a perfect seal in a matter of seconds.

For permanent or semi-permanent pipe lines 'Unicone' bolted type joints are usually employed and can be assembled far more quickly than any flexible joint giving positive anchorage.



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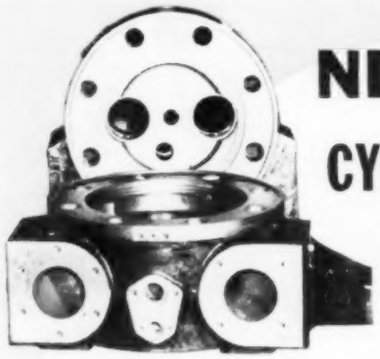

NIMCO CYLINDER HEADS

ENGINEERED FOR YOUR SPECIFIC OPERATIONAL PROBLEM

In addition to manufacturing a complete line of standard cylinder heads for most industrial engines, NIMCO redesigns heads to eliminate failures and fit the particular needs of the user. If you are faced with an unusual operational problem, let us give you the advantage of our experience in this field. NIMCO Cylinder Heads are made of Nimcoloy Cast Iron, Electric Furnace Cast Steel or Ductile Iron.

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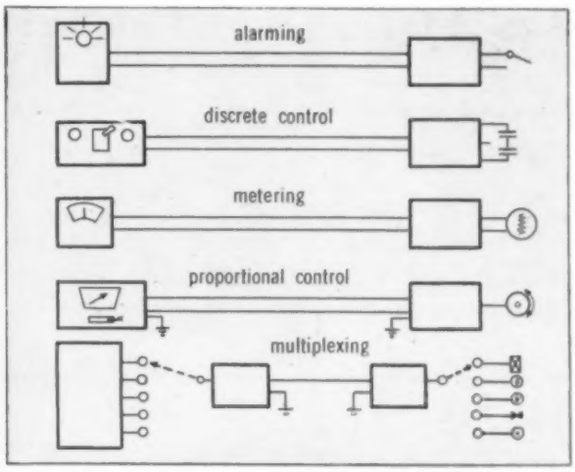
how to simplify

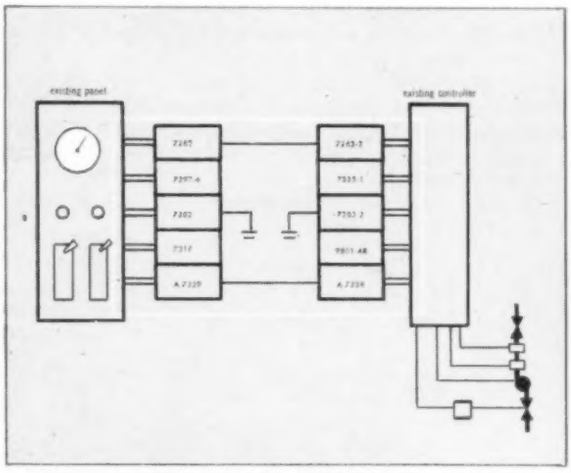
REMOTE CONTROL SOLUTIONS

STANDARD PLUG-IN MODULES now available from Sparton feature time-proven communication concepts in flexible control "building blocks".

These "off-the-shelf" modules enable positive remote supervision and control—for almost any problem—without excessive special engineering or construction cost.



5 BASIC SYSTEMS are available from Sparton: alarming (polarized d.c. pulses, tone, circuit make-break); discrete control and supervision (polarized d.c. pulses, tone, time-coding, pulse-time coding); metering (both digital and analog data); proportional control (polarized d.c. signals, tone, d.c. pulses, continuous d.c. signals); channel multiplexing (flip-flop, time-sharing, multiplexed tones).



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Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.

The following is a complete index of all the Rules of Thumb which have appeared in WORLD OIL and PIPE LINE INDUSTRY. Check this list to see that you have all the published Rules of Thumb in your notebook.

Engineering Design

1—How to find pipe weight from outside diameter and wall thickness.
2—How do you estimate compressor station fuel needs?
3—What is the hydrostatic pressure due to a column of oil H feet in height?
4—Find the stress in wall of pipe due to internal pressure.
5—How much pipe length is lost in making up screwed joints?
6—How to determine the buoyancy of bare steel pipe.
7—How to determine the crop acreage included in a right-of-way strip.
8—How to find the capacity of reciprocating pumps.
9—A practical way to calculate gas flow for pipe lines.
10—A quick way to determine size of gas gathering lines.
11—How to size electric motors for crude gathering system pumps.
12—How to find the size fuel gas line for a compressor station.
13—How to estimate energy costs for different pipe line throughputs.
14—How to select motor for field gathering pump.
15—How to determine the amount of microballoons in pounds to install in any tank, depending upon the desired depth of covering.
16—How to calculate the weight of gas in a pipe line.
17—How to calculate microwave hops on level ground.
18—How to estimate the compressor horsepower required for gathering systems where the discharge pressure is approximately 1000 psi.
19—How to determine the length of a pipe bend.
20—How to determine the length of pipe required for a wrinkle bend.
21—How to estimate the horsepower that can be transmitted by a shaft.
22—How to estimate the horsepower required to pump at a given rate at a desired discharge pressure.
23—How to size a gas metering run.
24—Estimate the average pressure in a gas pipe line using the upstream and downstream pressures.
25—How to estimate the time required to get a good shutin test on gas transmission lines and approximate a maximum acceptable pressure loss for new lines.
26—How to determine the most economical size for electric power conductors.
27—How to determine the maximum surge pressure in liquid-filled pipe line when a main valve is closed suddenly.
28—How to estimate the average pressure differential on the remaining meter runs of a parellel system when one or more runs are shut off.
29—How to determine the buoyancy of bare and concrete coated steel pipe in water and mud.

Pipe Line Construction

1—How much coal-tar enamel for a mile of pipe line?
2—How much primer for a mile of pipe?
3—How much wrapping for a mile of pipe line?
4—How to identify the schedule number of pipe by direct measurement.
5—How many cubic yards of excavation in a mile of ditch?
6—How much welding rod is required for a mile of Schedule 40 pipe line?
7—What is the cost of asbestos felt for a mile of pipe?
8—How deep should telephone and powerline poles be set in ground?
9—How many welds will the average welder make per hour on ordinary line pipe if stringer beads have been run?
10—How many pounds of electrodes are required per weld on line pipe?
11—What is the maximum allowable lengths of unsupported line pipe which is permissible?
12—How to determine the degrees of bend in a pipe which must fit a ditch which calls for a bend in both horizontal and vertical planes.
13—How to approximate the number of 94-pound sacks of cement needed to fill a form.
14—How to estimate the quantities of sand, gravel and cement required for one cubic yard of concrete.
15—How to calculate the contraction or expansion of a pipe line resulting from temperature changes and estimate the allowable for slack in loops.

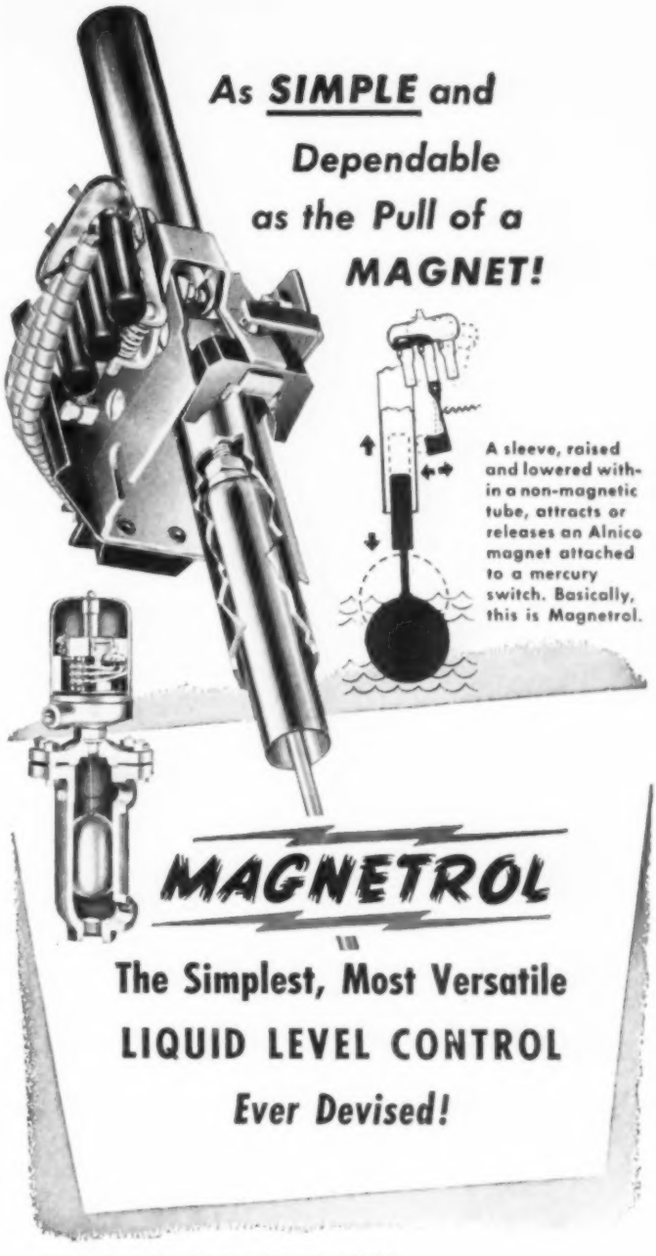
6—What is the cost of laying submarine pipe lines into the Gulf?
7—How to estimate the cost of a pipe line in the Rocky Mountain area.

Corrosion Protection

1—What spacing for test leads to measure current on a pipe line?
2—How can the life of magnesium anodes be predicted?
3—How can output of magnesium anodes be predicted?
4—What will be the resistance to earth of a group of graphite anodes, in terms of the resistance of a single anode?
5—How to estimate the monthly power bill for a cathodic protection rectifier.
6—What will be the resistance to earth of a single graphite anode?
7—How can the current output of magnesium rod used for the cathodic protection of heat exchanger shells be predicted?
8—How to find the voltage rating of a rectifier if it is to deliver a given amount of current through a given ground bed (graphite or carbon).
9—How can the resistivity of fresh water be determined from the chemical analysis?
10—How many magnesium anodes are needed for supplementary protection to a short-circuited bare casing?
11—What is the most economical size for a rectifier cable?
12—How to determine the efficiency of a cathodic protection rectifier.
13—How to estimate the number of magnesium anodes required and their spacing for a bare line or for corrosion "hot spots."
14—How to calculate the voltage drop in ground bed cable quickly.

Miscellaneous

1—What is the linefill of a given pipe in barrels per mile?
2—How fast does oil move in a pipe line?
3—How to gage a horizontal cylindrical tank.
4—How much gas is contained in a given line section?
5—Volume of liquid in vertical cylindrical tanks.
6—How can the approximate throughput capacity of a pipe line be estimated from the pipe size alone?
7—How to determine the size wrench needed for pipe flange stud bolts.
8—How to find the resistance and weight of copper wires.
9—How to identify the series number of flanged fittings.
10—How to determine the length of a V-belt.
11—How to estimate the cost of a pipe line in the Mid-Continent area.
12—How to estimate length of material contained in roll.
13—How to gage liquid flow where no weir or meter is available.
14—How to determine the number of gallons in a vertical cylindrical tank.
15—How to determine head loss due to friction in ordinary iron pipe line carrying clear water.
16—How to size pipe lines for water flow.
17—What is the line fill for a given pipe line?
18—How many cubic feet of gas in a mile of pipe line?
19—How to compare the cost of operating an engine on diesel fuel and natural gas.
20—How to estimate the amount of gas blown off through a line puncture or during a short blowoff.
21—Determination of leakage from gas pipe line using the pressure drop method.
22—Correct the volume of light liquid fuels from actual temperature to a base of 60° F.
23—Estimate the capacity of a pipe line per linear foot using the inside diameter.
24—How to determine the friction loss for water or light liquid in a length of hose.
25—Useful conversion factors for the Pipe Line Rule of Thumb Notebook.
26—Useful conversion factors for the Pipe Line Rule of Thumb Notebook.
27—How to convert water flow rates quickly to weight of steam and water in heat transfer calculations.
28—How to estimate torque to apply to a flange bolt without overstressing it.
29—Useful mathematical shortcuts for quick field calculations.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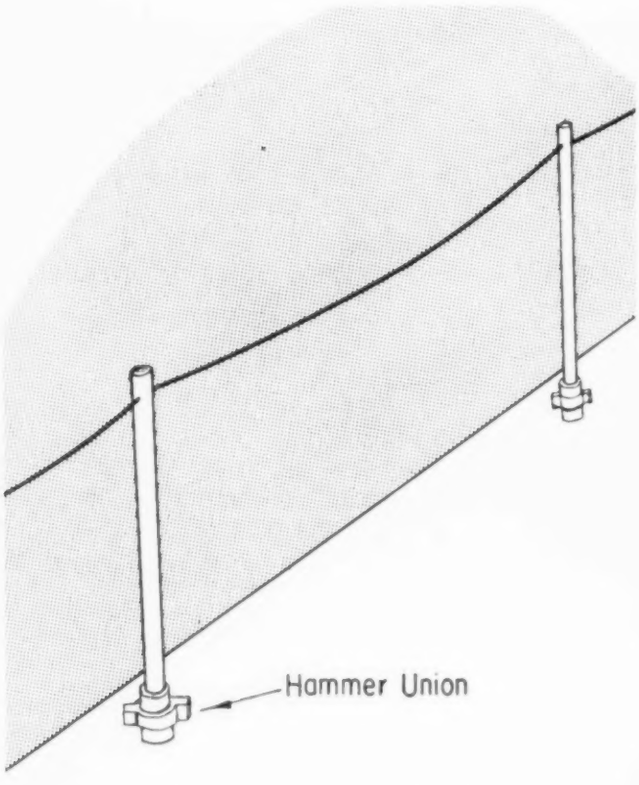
How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



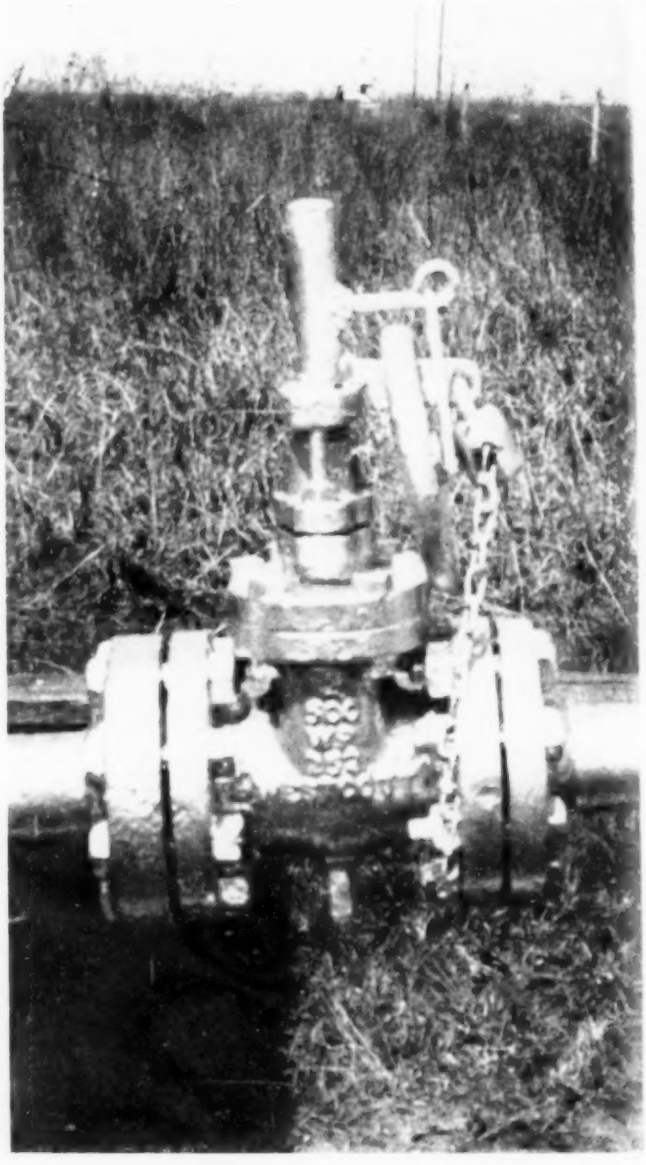
Removable Safety Railings Made from Hammer Unions

Hammer unions make a removable safety railing for pipe laying barges, storage tanks, or restricted areas that can be knocked down in a hurry.

There may be times that it is advisable to have some type of guard railing available when loading barges, painting a storage tank, or working in the vicinity of explosive vapors. The nature of the facilities involved may not permit a permanent type of railing but could be adapted to the easily removable one shown above.

Male threaded fittings are installed along the line of the desired railing as the only permanent features of the guard rail. They present a minimum obstruction during ordinary operations. The matching thread is attached to the desired length of pipe, and holes are drilled at the top of the pipe to afford installation of the cable as shown.

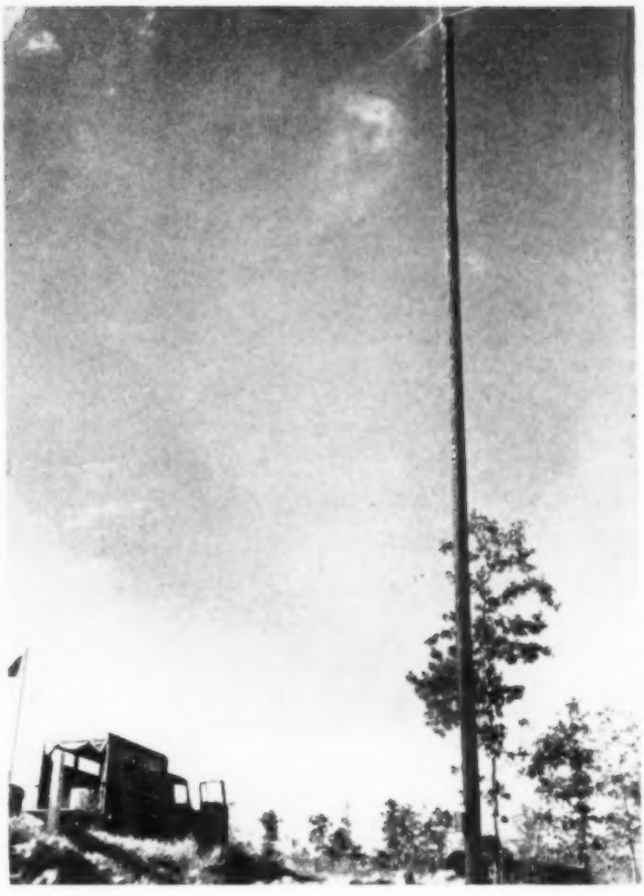
Posts provide a rigid support for the cable when in place, and the versatility of the installation easily compensates for expense involved.



Make Covering and Lock To Protect Valve Wheel

This cheap, easy protection for a valve wheel can b made from scrap pipe and chain. Remove the top of th packing gland and braze to it an ear with a hole in i Replace the packing gland, and use a piece of ¾-inc pipe to form a collar for the valve stem. Weld an ey hook, through which is a welded link, to the collar an you have the covering shown here.

The valve wheel is placed on the ear, as shown, an the welded link swings down to hold it in place. Lo the link in place with a company padlock, secured wi a piece of chain looped under the valve body.



Pole Antenna Increases Range of Spread Radios

When long range contact is necessary, during line tests or scraper running, one contractor found this novel solution to increasing the range of key mobile units.

He installed 75-foot poles with a long lead-in at strategic points along the line. With the increased range available, the spread foreman, chief inspector and maintenance personnel can keep in touch with operations far beyond the normal limits of their units.

When not in use the antenna lead is kept handy in a locked aluminum reel box. To make use of the extra antenna, the operator needs only to drive up and plug the lead in the antenna jack.

Sleeve Bracket Gives Skid Straight Pull

To reduce barked shins, space requirements, and cable troubles on a pipe line construction job, install tow-bar brackets on all skid-mounted equipment.

During fabrication of the skid, slide a one-foot sleeve (of the next size larger pipe) on to the front cross-member before welding the member to the I-beams. A bowing bracket is welded to the sleeve, with an eye to receive the cable. The sleeve-bracket is held centered by welding two retainer rings to the cross member.

The bracket is free turning through any vertical angle, and returns to a downward position when the strain is released. This type bracket can be easily adapted for use on portable pumps, engines and all types of skid-mounted field units.

Mount Salvaged Can On Post to Collect Waste

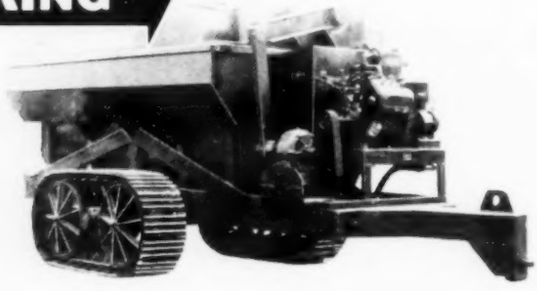
A five gallon can with a two inch collar welded on the bottom can be screwed to a short two inch pipe post to receive all waste and trash that would otherwise clutter up the area. Set the post in concrete near the steps of a storage tank, or entrance to a pipe yard.

The two inch coupling on the bottom of the can discourages placing the can on the ground, or floor, and

when properly attached to the post the can would be solid enough to resist being blown over by the wind or accidentally kicked over. By keeping the threads lightly oiled the container can be easily detached and emptied at a central dump or trash burning area.

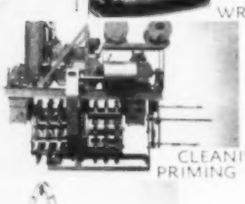
A similar installation, using large diameter pipe instead of a five gallon can, may be fabricated as a semi permanent fire extinguisher station. This type of station could save valuable time by having an extinguisher located near any work in progress in a tank farm.

NO COKING



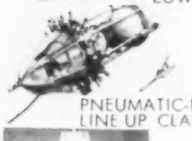
COATING AND WRAPPING MACHINES

PERRAULT-AMERICAN 25 BBL KETTLE



CLEANING AND PRIMING MACHINES

PNEUMATIC-TIRED LOWERING-IN CRADLE



PNEUMATIC-INSIDE LINE UP CLAMP

PIPE CRADLES

GLASS, ASBESTOS AND KRAFT WRAP

ROCK SHIELD

Agitator mat bars scrape entire kettle bottom every 3.35 seconds, allowing no material to remain on bottom long enough to burn, eliminating coking completely. Mat motion is slow enough so dope is not "whipped." Heavy mat will not float, scrapes bottom thoroughly.

OTHER FEATURES: Actual capacity is 25 bbl.-plus; Completely insulated; Melts dope fast; Drain valve inside kettle requires no pre-heating; Burner gravity-fed, no pump required; Fuel is diesel oil; Fuel tank capacity is 50 gals. Perrault-American 25 bbl. Kettles give contractors the most economical, rapid, maintenance-free-and-easy service. Other sizes available. For more information write or phone.

AND: PATCH POTS, BURNERS AND ACCESSORIES. TONGS, SLING BELTS, AND HOOKS, LINE-UP CLAMPS. HAND TOOLS. SUPPLIES AND EQUIPMENT OF EVERY SORT.

PERRAULT EQUIPMENT COMPANY

1130 N. BOSTON — TULSA, OKLA. — TELEPHONE LUther 5-1103

Solvent Sprayer Aids Cleaning Engine Parts

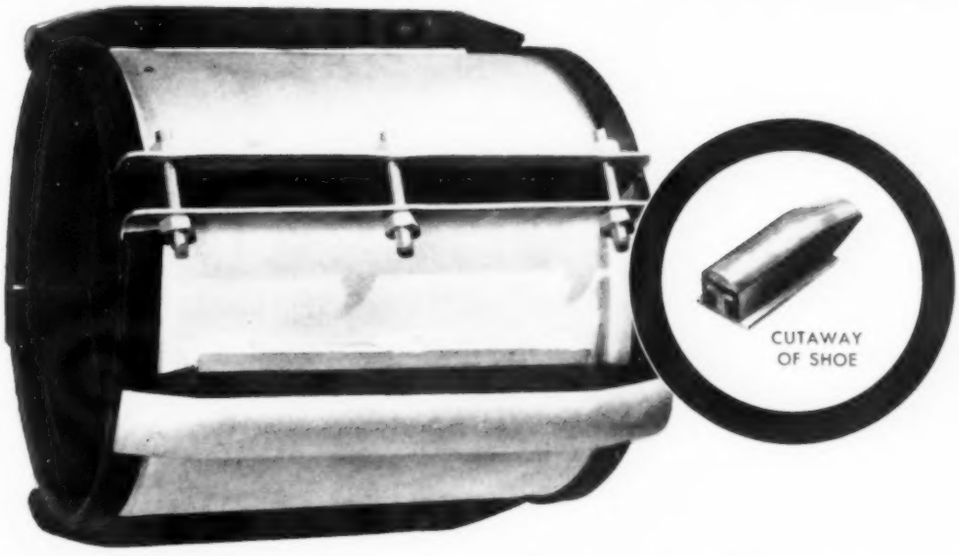
When overhauling engines, dirty parts are sometimes hard to reach. One station maintenance man installed a pressure connection on the solvent drum so he can spray solvent on the inaccessible parts.

An air line is connected to the top of the solvent drum through a regulator set at 5 pounds per square inch. A valve at the bottom outlet of the drum controls the flow of solvent through a hose attached with a fine spray nozzle.

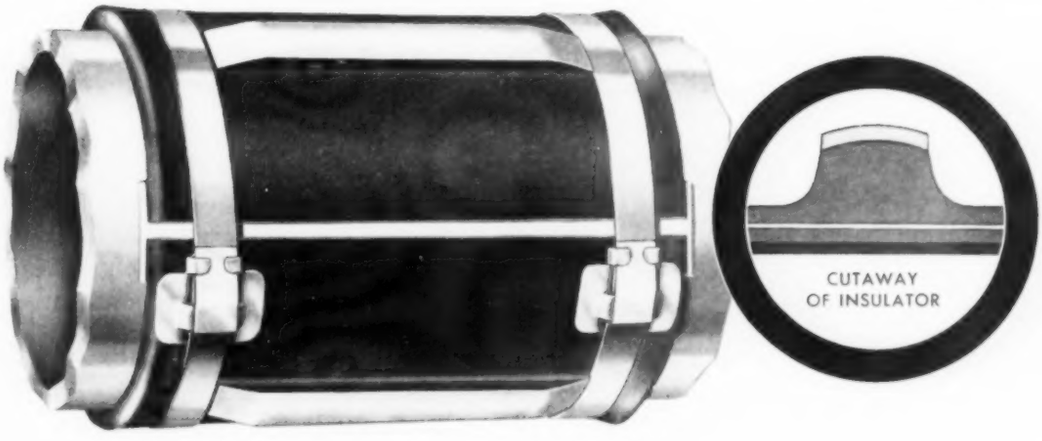
Make Hose Rack From Reinforcing Rod

To aid the grounds keeper in handling water hose for sprinkling the grass, this rack made of bent-up reinforcing rod is very useful. Three

Model 55 Maloney Insulators for LARGE JOBS



Model 56 Maloney Insulators for Small Jobs



Maloney Insulators for *Every Job!*

Maloney Crossing Insulators for pipeline casing are exceptionally rugged, easy-to-install . . . *and adaptable to a wide range of pipe sizes and differentials.*

Because they are bonded metal-to-neoprene-to-metal, Maloney Insulators provide good shock-absorption, plus flexibility to compensate for pipe shifting.

Streamlined "sled-type" steel runners make for easy entry into the casing, and prevent hanging-up on casing welds as pipe is being run.

Model 55 Maloney Crossing Insulators, in all sizes through 36", are fitted with an extra-wide steel band for positive grip. Model 56, for pipe sizes through 12" with 2" nominal pipe size differential, are fastened to the carrier pipe with stainless steel bands. Both types offer greater dependability—greater protection against corrosion with high dielectric strength neoprene, and against physical damage with steel runners—than any other insulator on the market. Maloney Crossing Insulators are in use on most of the country's major pipelines.

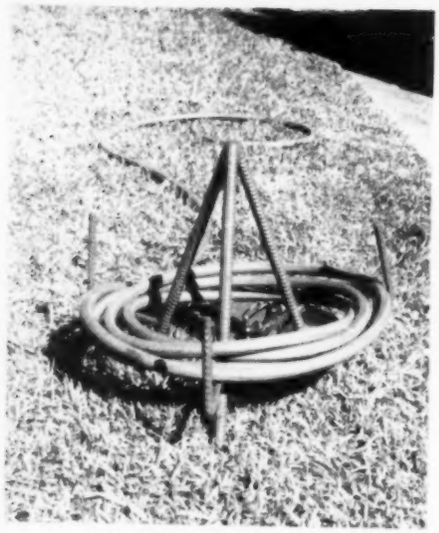
"Something from the Irishman"

F. H. MALONEY
Company

2301 TEXAS AVE. • FA 3-3161 • HOUSTON

SINCE 1932 — PRECISION IN RUBBER — METAL — PLASTICS

For more data on advertised products, use Readers' Service Cards, last page.



sections of three-quarter-inch rod are welded together at one end to form a three-legged stand. Sections of one-half-inch rod are then bent into right angles and welded to each of these legs to form the shelf or rack for the hose.

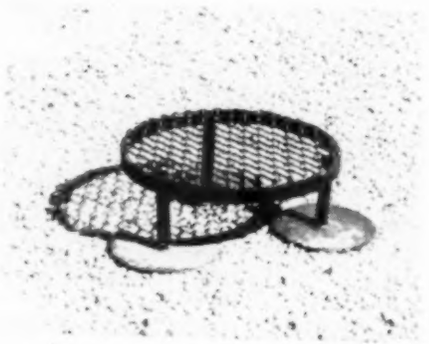
This pyramid-shaped design makes winding and unwinding the hose an easy operation.

Device Keeps Livestock Off Telephone Guy Lines

To decrease maintenance and repairs of telephone and power lines caused by livestock rubbing against

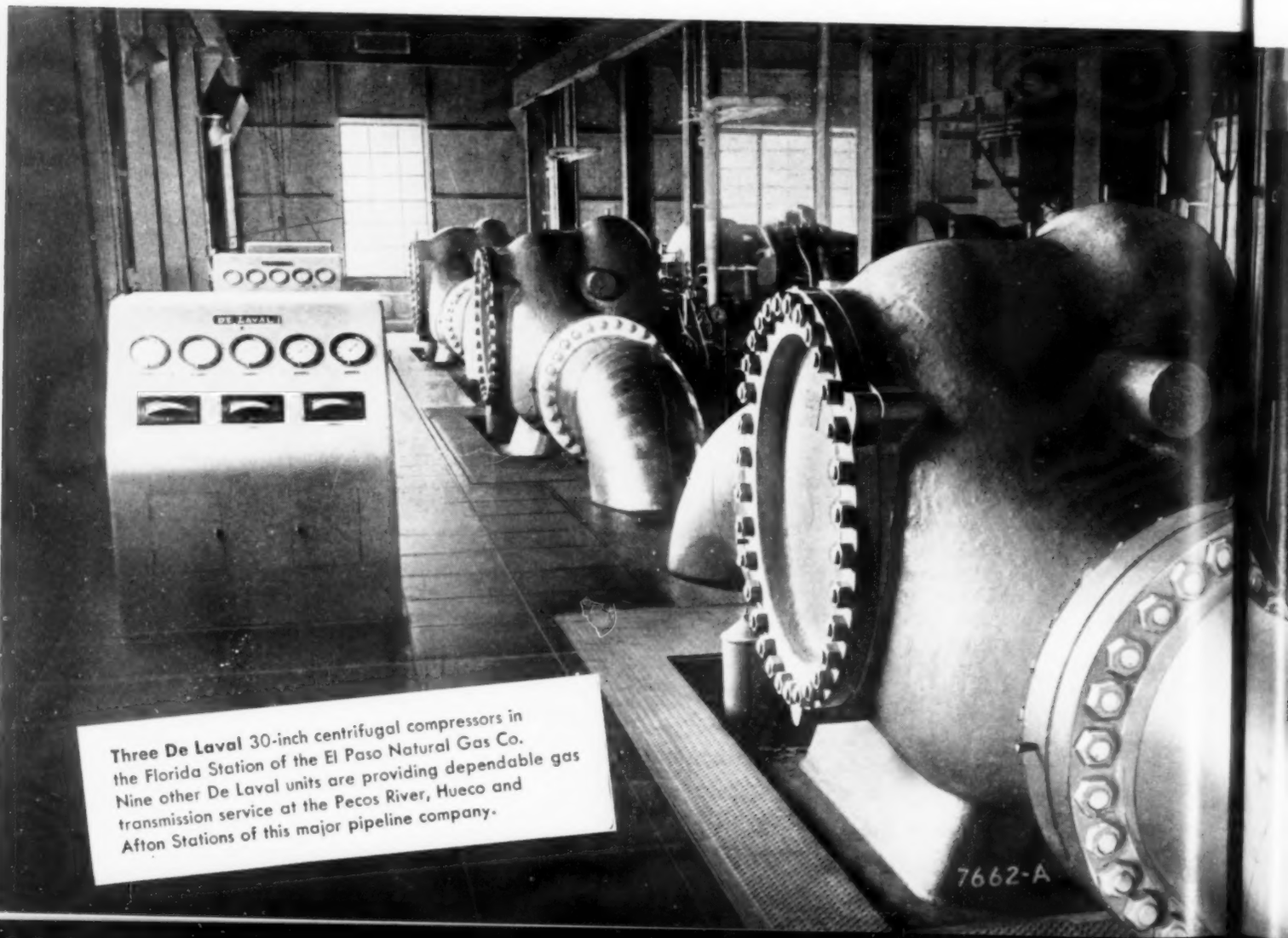
guy lines in open range country, hang the pictured "discourager" on the guy with a few wraps of heavy wire.

All the material needed would be a length of 2-inch by 4-inch, through which has been driven a number of spikes at right angles to each other, and a few feet of small diameter wire line.

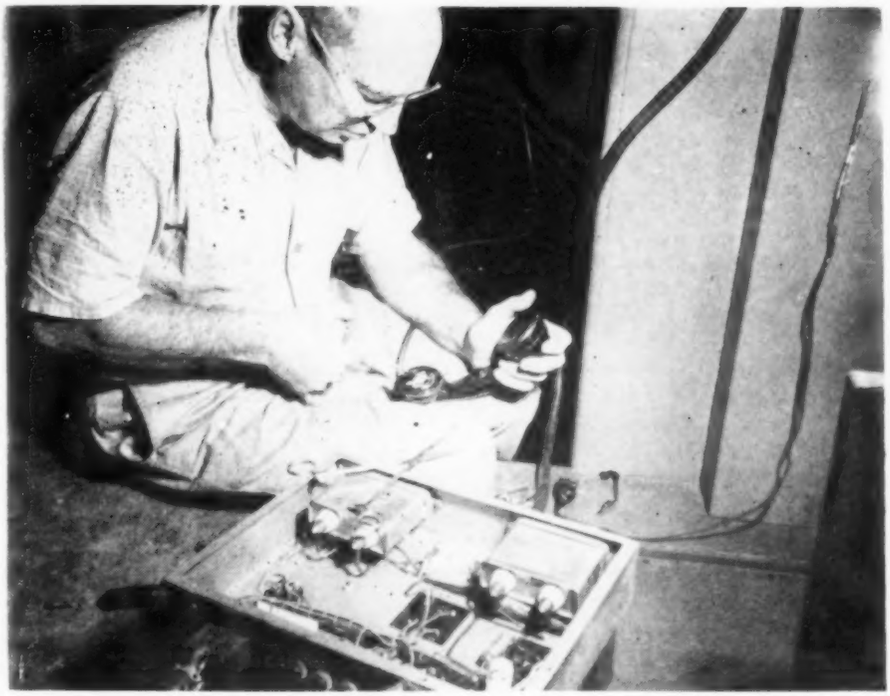


Place Shoe Scraper Near Station Entrance

This simple welded assembly placed near all building entrances makes a good shoe scraper for cleaning mud and other foreign material from operators' shoes. It is made of a prefabricated steel grid cut on a one-foot diameter welded to a one-inch section of 12-inch pipe. The scraper rests on three legs of ¾-inch rod welded to thin-gage steel plates about five inches in diameter.



Three De Laval 30-inch centrifugal compressors in the Florida Station of the El Paso Natural Gas Co. Nine other De Laval units are providing dependable gas transmission service at the Pecos River, Hueco and Afton Stations of this major pipeline company.



Hemostats Handy for Electrical Repairs

Old worn hemostats from a surgeon's kit can be very useful in making soldered connections in confined areas on station electrical maintenance work.

Clamps are used as pliers for holding the mating parts together while soldering. As such, they are valuable as an electrical tool after they are salvaged from the operating room.

Racks on Water Tower Hold Irrigation Tubing

At many Southwest compressor and pump stations where a special irrigation system is necessary to keep the grounds watered, aluminum irrigation tubing can be stored handily below the water tank as shown. Metal straps, ⅛ by 1 inch, are formed into simple hooks and bolted to the storage tank supporting legs.

DE LAVAL

CENTRIFUGAL COMPRESSORS

on the job at El Paso Natural Gas

De Laval centrifugal compressors offer many important engineering features. (1) They are designed to handle an increased ultimate flow, can be quickly converted to larger capacities by replacing the impeller, diaphragm and a few minor parts. (2) The high pressure shaft seal eliminates leakage, consumption of sealing oil is negligible. (3) There is only one moving part—the rotor—which has ample clearance. (4) Units are compact, require smaller foundations and smaller stations. (5) First costs and installation costs are low.

Bulletin 503 gives data on De Laval Centrifugal Compressors. Write for your copy.

DE LAVAL *Centrifugal Compressors*

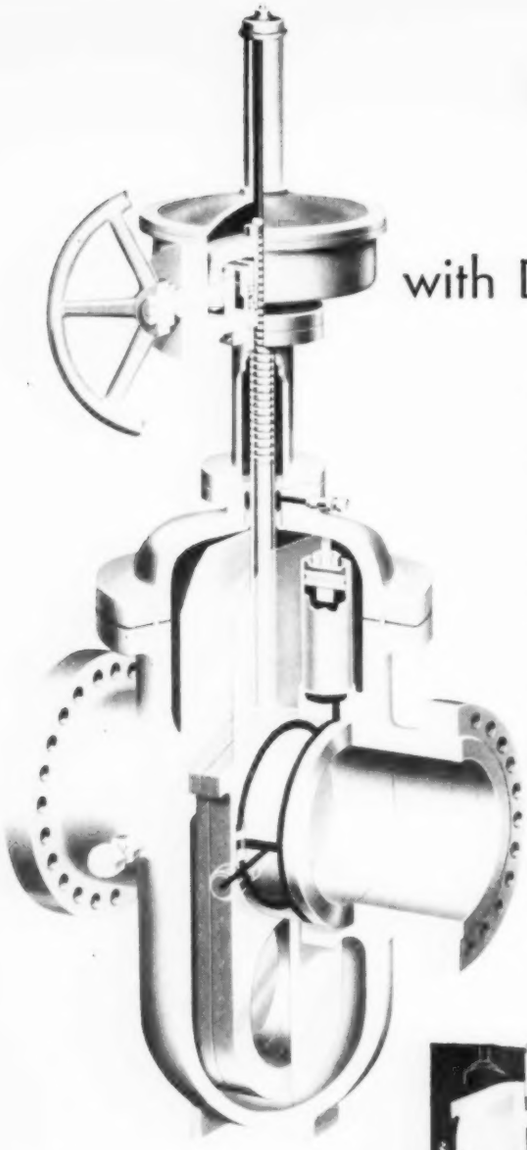
DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

DL375

NEW ADVANTAGES "GO ON THE LINE"

with DARLING-McEVOY Conduit Valves



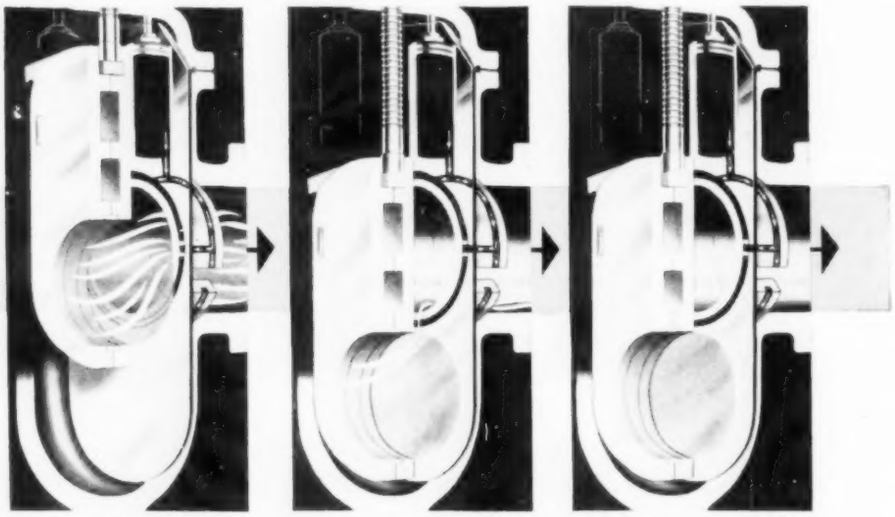
Compare these features with *any* other pipe line gate valve:

1. **EVERY CLOSURE LEAK-PROOF.** No forcing. Positive, automatic self-sealing between seats and gate and seats and body by means of sealing compound.
2. **NON-DIRECTIONAL.** Flow may be in either direction.
3. **TWIN SEALANT RESERVOIRS.** One for each port. Sealant feeds automatically to downstream side only.
4. **NEGLIGIBLE SERVICING.** Leak-proof closure requires very little sealant. Reservoir capacity ample for a great many operations.
5. **SMOOTH, FULL FLOW.** No impediments. No turbulence. No pockets to collect sediment.
6. **REPACKING UNDER PRESSURE.** Construction permits replacement of stem packing media with valve wide open under full line pressure.
7. **EXCEPTIONAL PERFORMANCE AND LIFE.** Self-aligning gates. No wedging. Non-distorting seats, protected when valve is open or closed.

Darling-McEvoy conduit valves, made in 8″ and larger sizes, are fully field proved and are now operating continuously on various major lines. For complete information on the self-sealing feature and many other advantages of this unique valve, ask for Bulletin 5402.

Above: *Cutaway showing heavy, self-aligning gate and parallel seat assembly, with one of the two sealing systems indicated.*

Right: *Diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

CLOSED... *Jumper in gate now permits differential pressure to feed sealant into seat groove to check any remaining flow.*

AUTOMATICALLY SEALED. *Pressures again in balance. Tightness established. No additional sealant used until again needed.*

DARLING VALVES

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Pipe Line Men

IN THE NEWS

John L. Gere

Burton F. Wiand

Cities Service Gas Company has elected three new directors, **John L. Gere,** chief engineer; **Russel Hofsess,** manager, Production and Supply department; and **Burton F. Wiand,** manager, public and industrial relations, all of Oklahoma City. Two new directors were also named to the board of directors of Cities Service Gas Producing Company, a subsidiary. They are **George V. Rowland,** industrial sales manager, and **A. W. Levan,** assistant secretary. **E. W. Lamparter,** superintendent, Tax department, was named assistant treasurer of both companies. Gere has been chief engineer since 1953. He joined Cities Service in 1927, serving nine years in the Engineering department. He served seven years in the general office as assistant department head, assistant superintendent of operations and assistant to the vice president in charge of operations. Gere also spent 12 years in the field as production engineer, general meter inspector and division pipe line superintendent.

Russel Hofsess

Hofsess has been with the company since 1933. He was assistant superintendent of operations at Bartlesville, and in 1951 was named superintendent of the Production department. Since 1953 Hofsess has served as manager of production and supply. Wiand joined Kansas City Gas Company, a former Cities Service subsidiary now known as Gas Service Company, in 1935; he was customers' relations representative for that company and later attorney in the Legal department, leaving that position to become a special agent for the Federal Bureau of Investigation. He was associated with the Vendo Company Kansas City, for five years and has been manager of Cities Service public and Industrial Relations department since 1952.

Rowland has been with the gas company since 1919. He has 25 years experience in natural gas sales to industries and governmental installations. During his first ten years with the company, Rowland devoted his time to various phases of engineering, the establishment of a safety program and construction of new transmission facilities. Levan has been with Cities Service since 1920, serving as assistant secretary of Cities Service Gas since 1947. Lamparter joined the firm in 1936 and has been superintendent of the Tax department since 1949.

•

W. E. Winn has been elected vice president in charge of production of **Southern Natural Gas Company.** Winn joined Southern Natural in 1952 as manager of the Exploration and Production division in 1952 when the company expanded and transferred its exploration and production activities to New Orleans. Winn came with Southern Natural from Ashland Oil and Refining Company, where he was representative in Louisiana and Mississippi and the Texas Gulf Coast region.

•

Shell Pipe Line Corporation, Houston, has named **J. E. Condon** manager of the purchasing-stores. Formerly he was manager of purchasing-stores for Shell Development Company in Emeryville, Calif. **R. H. Chase,** senior head office representative in purchasing-stores, replaces Condon. Joining Shell in 1937 in Avant, Okla., Condon was transferred to New York in 1950 and later moved to Houston as assistant manager—stores, Shell Chemical Corporation. He was named to the post in Emeryville in 1954.

•

B. E. Harrell has been named manager of the newly-created department of gas supply and gas sales for **Arkansas Louisiana Gas Company.** He will be in charge of gas purchases, industrial sales, sales to other pipe line companies, exchange agreements, gasoline plant processing agreements, producer relations and industrial customer relations.

•

Frank O. Prior is API's new vice president for transportation, elected at the recent meeting in Chicago. President of Standard Oil Company (Indiana), Prior has been a director of the API since 1946. Starting his oil industry career with Midwest Refining Company, he became chief engineer and general operating superintendent of Dixie Oil Company, Shreveport, La., in 1928, later serving as vice president and president. In 1930 Prior was named director and president of Stanolind Oil and Gas Company and became director and vice president-production of Standard in 1945, at the same time becoming chairman of the board of Stanolind Oil and Gas Company, Stanolind Oil Purchasing Company and Stanolind Pipe Line Company. Prior was appointed president and director of Wyco Pipe Line Company in 1946; president and director of Stanolind Marine Transport Co., in 1948; and executive vice president of Standard (Indiana) in 1951. He has been president since 1955.

F. O. Prior

•

The Transportation department's Tri-State division, **Sohio Pipe Line Company,** and the Southwestern division, **Sohio Petroleum Company,** have announced changes in management assignments. **Lyle Bertram,** area supervisor, Centralia, Ill., will move to division headquarters in Grayville, Ill., where he will become assistant to **C. R. Elder,** division superintendent. Bertram's duties will include administrative work, operation planning, public relations, and supervisory and employe development and training.

Tyrus Mercer, area supervisor, Magnolia, Ark., will replace Bertram. **Earl Coffey,** area maintenance foreman, Norris City, Ill., will become Magnolia area supervisor, with headquarters in Magnolia, Ark., and **H. E. Applegate,** field gager in the Centralia area, maintenance foreman.

•

Fred Hunter has been named gas storage field superintendent for **Northern Natural Gas Company's** underground storage project near Redfield, Iowa. He has been continuously employed with Northern since 1950 and has worked as field draftsman, instrumentman, party chief and division engineer for the field engineering section of the Engineering department. Northern has also promoted **Daryl L. Smith** to gas storage field engineer for Northern's underground storage reservoir near Redfield, Iowa. He joined Northern in 1953 as an engineering aide at Oakland, Neb., and was promoted to instrumentman at the same location. Since July, 1955, Smith has been associated with underground storage activities.

Years Of Experience Are Yours . . . In These Fact-Filled Volumes

PLASTICS ENGINEERING HANDBOOK
Society of Plastic Engineers, Inc.

Provides excellent coverage of such important subjects as design, materials, processes, equipment, finishing, assembly, testing and standards of plastics and plastics products.

850 pages, 1954 ..... **Price $18.00**

SOLVENTS MANUAL
By Cyril Marsden

A comprehensive quick-reference guide to industrial solvents. In over 200 individual monographs on important solvents, the book provides for each: synonyms—trade names, physical and chemical properties, source and manufacture, grades, azeotropes, physiological properties, storage and handling, fire hazards, source of supply.

444 pages, 1954 ..... **Price $12.95**

PLASTICS FOR CORROSION-RESISTANT APPLICATIONS
By Raymond B. Seymour and Robert H. Steiner

This valuable book supplies engineers with background information necessary in selecting proper plastic for construction in corrosive atmospheres. It begins by describing relationships between chemical and physical properties and molecular structures of plastic materials. Then follows expert information on use of plastics as protective coatings, organic linings, chemical resistant mortar cements, casting resins, plastic foams, impregnants, industrial adhesives and reinforced materials.

449 pages, 1955 ..... **Price $7.50**

Order From:

Book Department
THE GULF PUBLISHING COMPANY
P. O. Box 2608 Houston 1, Texas

R. C. Kolbye has been named treasurer of **Commonwealth Oil Company** of Houston and **Marine Gathering Company,** Commonwealth subsidiaries which operates a gas processing plant in Lake Arthur, La., and a pipe line connecting the plant with producing gas wells in the Gulf of Mexico. Kolbye formerly was associated with Ada Oil Company. From 1949 until 1951, when he joined Ada Oil, Kolbye was with Arthur Andersen & Company, national accounting firm.

R. C. Kolbye

•

Fred T. O'Leary, Houston, has been promoted to superintendent of natural gasoline and gas operations for **Continental Oil Company's** CATC marine region. Formerly senior production engineer in the CATC region, he will continue to make his headquarters in Houston. Conoco is operator for the CATC group, including Conoco, Atlantic Refining Company, Tidewater Oil Company and Cities Service Oil Company.

•

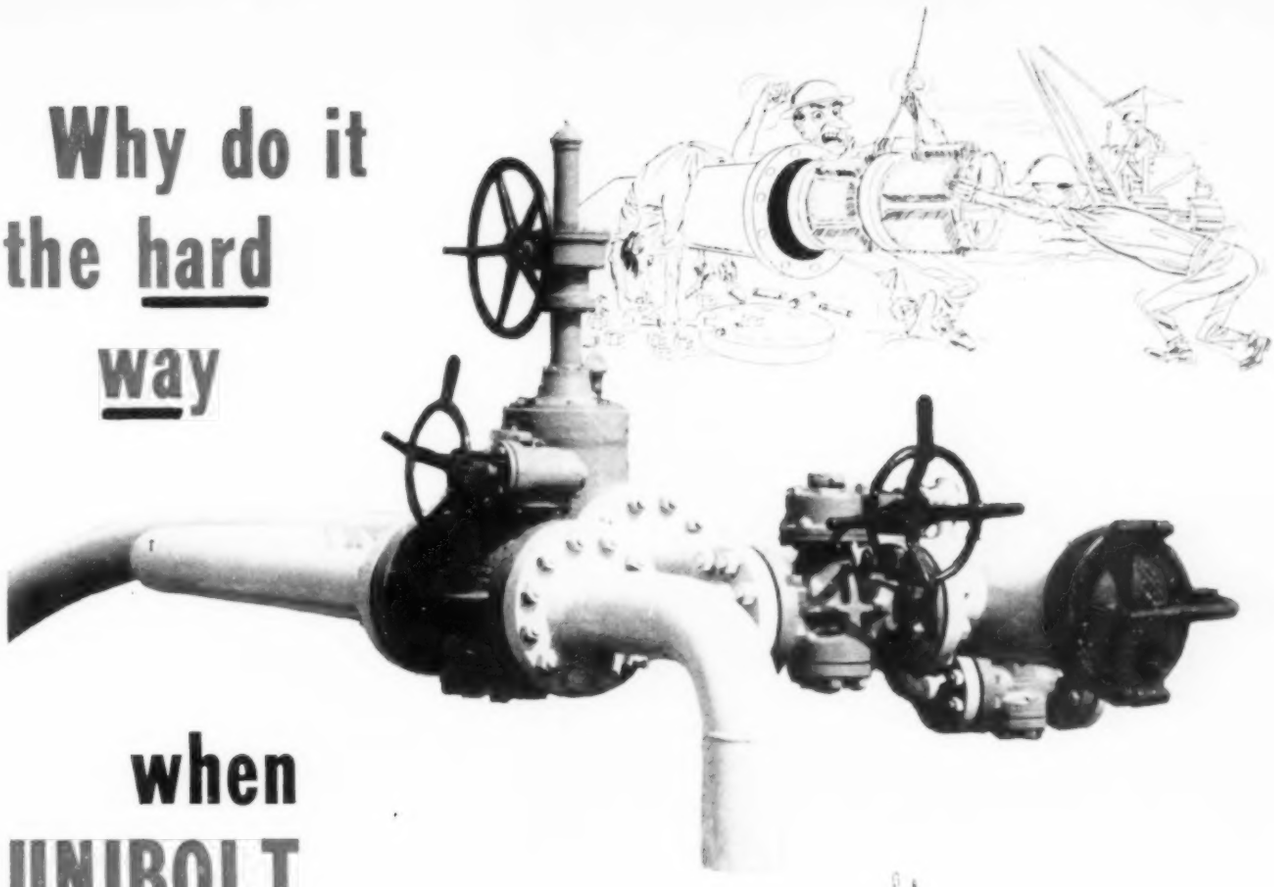
George W. Anders has been appointed director of public relations for **Texas Gas Transmission Corporation.** Anders will be in charge of the company's public relations, financial relations, publications and advertising with headquarters at Owensboro, Ky. Prior to joining Texas Gas, Anders was assistant manager of public relations for Texas Eastern Transmission Corporation, where he has been employed for the past eight years. Before that he was with Interstate Oil Pipe Line Company.

George W. Anders

•

J. B. Balmer, president of John Wood Company, New York, has been elected a director of the **American Gas Association.** His two year term expires October 1958.

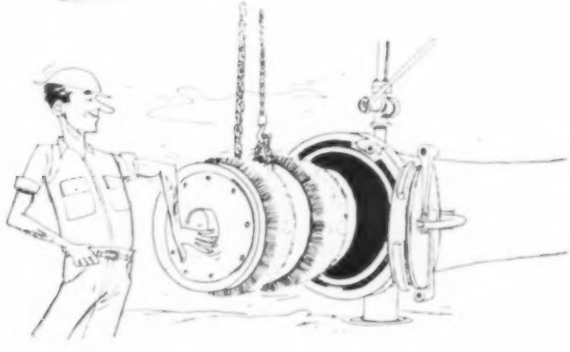
Why do it the hard way



when UNIBOLT Scraper Traps

(with oversize barrel)

make pigging so easy!



Unibolt Scraper Trap Closures are the most convenient, most practical means for blanking off a line so that pigs may be easily inserted and removed from the trap. The scraper barrel being slightly larger than the pipe itself, the pig is easily inserted or removed. It is no longer necessary to "fight" the pig in and out of the trap. Release two bolts and the blanking plug swings open on a sturdy hinge. Swing the trap shut, tighten the bolts, and that's all. Let the pumps do the hard work. No heavy blind flanges to lift on or off. No multiple bolts to release and make up. Nothing to fall on the workmen. No leaky threads. An oil-resistant gasket seals automatically . . . seldom needs replacing.

THORNHILL
P. O. BOX 1184

UNIBOLT ONE BOLT COUPLING

CRAVER CO.
HOUSTON, TEXAS

For more data on advertised products, use Readers' Service Cards, last page.

John M. Starke, vice president in charge of gas purchases of **Southern Natural Gas Company,** has been transferred to the company's new Houston office. Starke will devote his time to the gas supply operations of the company. Joining Southern Natural in 1929, Starke was with Southern Production Company, Inc. in Shreveport from 1940 to 1949, serving as a vice president and member of the board of directors. He rejoined Southern Natural Gas in 1949 as manager of the Land and Lease department, and in 1950 he became vice president and in charge of the company's exploration and production activities.

John M. Starke

•

J. M. Linehan, president of **Mid-Continent Pipe Line Company,** has also been named general manager of the Crude Oil Sales and Purchase department of Sunray Mid-Continent Oil Company.

•

W. A. Rose has been named president of **Majestic Contractors Limited** with headquarters in Edmonton, Alberta, Canada. Rose was associated with Anderson Brothers Corporation for 12 years. When Anderson Brothers disposed of its pipe line business, Rose took over as general manager of Anderson Development Corporation, uranium operations, in New Mexico. He left Anderson Development to join Majestic Contractors Limited.

W. A. Rose

•

K. G. Smith has been named to succeed the late **J. L. Copeland** as district superintendent for **Interstate Oil Pipe Line Company** at Magnolia, Ark. Smith has been serving since September as assistant district superintendent of the Magnolia district. Smith formerly was district foreman in Interstate's Brookhaven district.

•

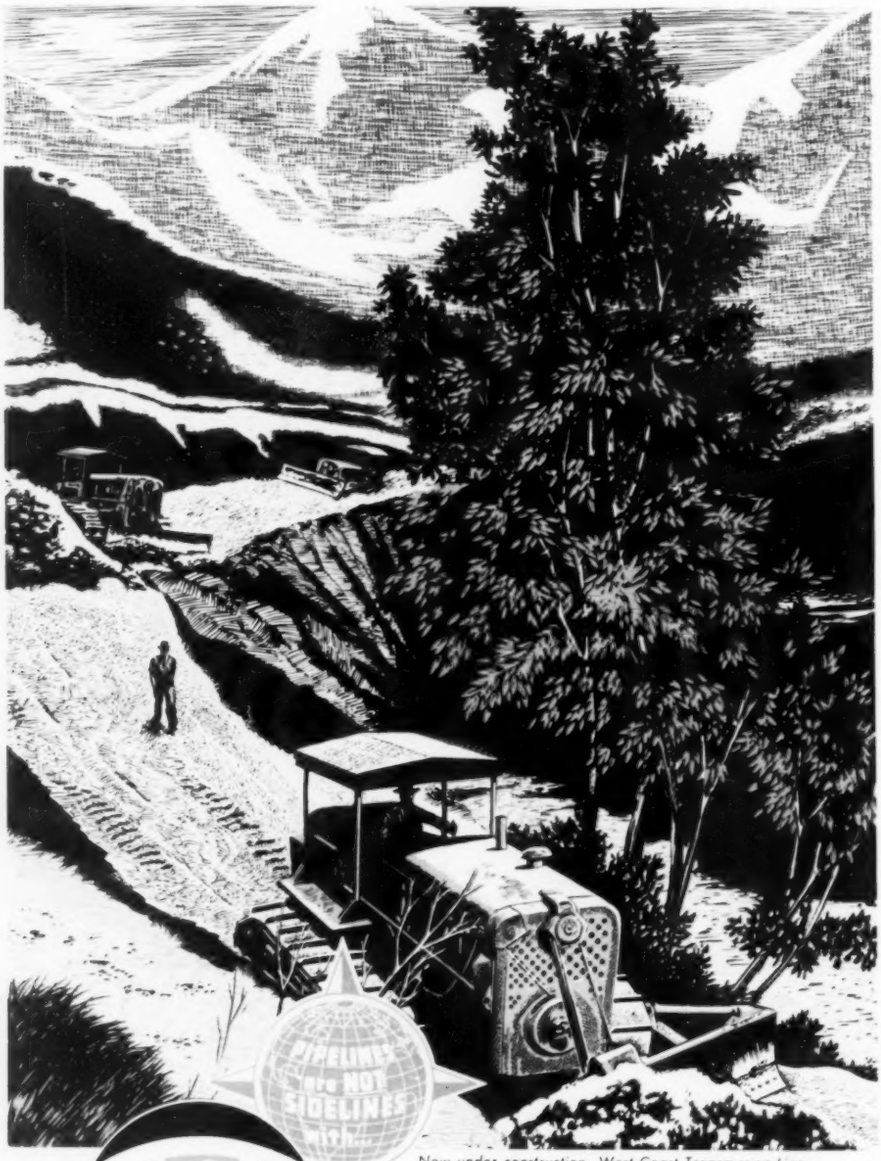
T. S. Llewellyn has been named senior engineer for **Service Pipe Line Company,** Tulsa, succeeding **W. L. Kennedy,** who has joined the Bechtel Corporation, San Francisco.

•

Williams Brothers, pipe line builders and engineers of Tulsa, has announced the election of three new vice presidents, **C. M. Collins, Emery G. Thiel** and **Maurice B. Kite.** Collins, formerly executive vice president of Williams Brothers Corporation, engineering division of Williams Brothers Co., joined the firm in 1945. Thiel, was advanced from secretary-treasurer of the firm. He has been with Williams Brothers since 1946. Kite, who will be manager of the general construction division, joined Williams Brothers in 1954 as superintendent of pump station construction on the Minnesota Pipeline Company project.

•

Lonnie W. Wege has been appointed assistant manager of industrial relations for **Cities Service Gas Company,** Oklahoma City. Wege fills the vacancy left by the transfer of **R. E. Hill to** Petroleum Chemicals, Inc., at New Orleans.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NBT BLDG. • TULSA, OKLAHOMA • CABLE ADDRESS: WILLBROS
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CANADA • BOLIVIA • COLOMBIA • ECUADOR
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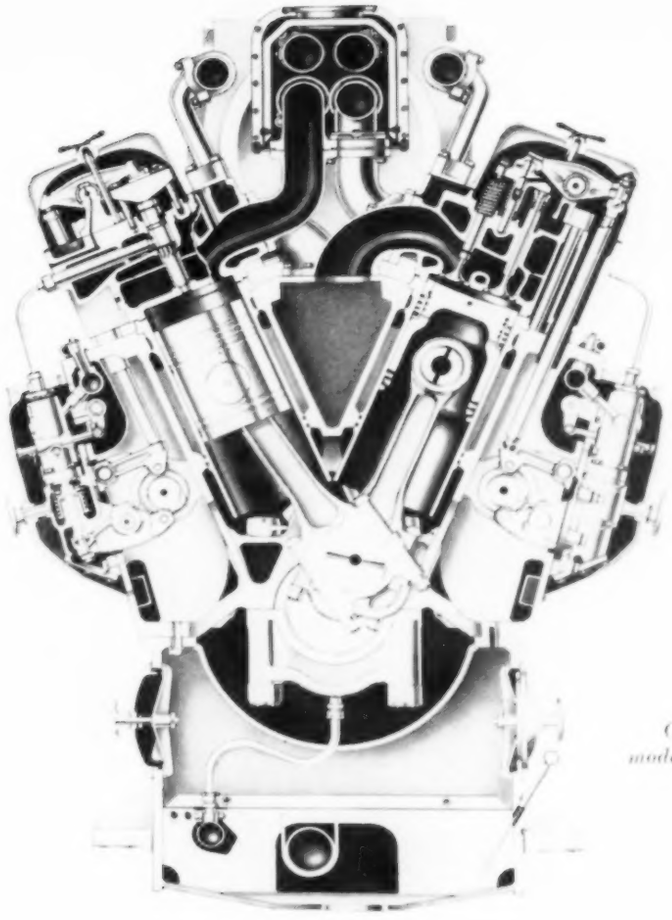
OIL • GAS • WATER • PRODUCTS PIPELINES • PUMPING STATIONS
Now under construction: West Coast Transmission Line



Cross section of vee model ALCO *251 diesel.*

MODERN ALCO 251 DIESELS

ARE DESIGNED FOR LIGHTER WEIGHT, HIGHER POWER, LOWER COSTS

ALCO 251 diesel engines offer light weight, high power, utmost reliability — at low cost — for all stationary and marine applications. The basic 251 engine is easily adapted, by simply adding standard parts, to pipeline pumping, marine service, power generation, oil-well drilling, power "packages" and many other applications.

Available in three sizes, in-line six, vee 12 and vee 16, ALCO 251 diesels range in horsepower from 550 to 2400. All three models have interchangeable parts for easy replacement and maintenance. ALCO has located complete parts warehouses in seven cities throughout the country, and two "repair and rebuild" centers are also established.

You get better economy. Not only in low first cost from ALCO's production line, but in low operating, installation and maintenance cost the ALCO 251 diesel can mean a real economy.

ALCO 251 DIESEL ENGINE SPECIFICATIONS

No. Cyl.	Bore and Stroke (in)	RPM Range	BHP Range	Approx. Wt. Dry (lb)
6	9x10½	350-1000	550- 900	22,100
12	9x10½	350-1000	1100-1800	32,650
16	9x10½	350-1000	1470-2400	42,000

For further information about these modern, high-powered, light-weight diesels, contact your nearest ALCO sales office or write P. O. Box 1065, Schenectady 1, New York, for a new brochure giving all details.

ALCO

ALCO PRODUCTS, INC.

NEW YORK

Sales Offices in Principal Cities

S. P. Osborn has been elected comptroller of **Texas Eastern Transmission Corporation.** Osborn, who has been assistant comptroller since 1955, will fill the position vacated when **Orville S. Carpenter** was elected president of the company. Osborn joined Texas Eastern in 1948 and has served as assistant chief accountant, chief accountant and assistant comptroller. Before joining Texas Eastern, Osborn was associated with Columbia Gas System companies.

S. P. Osborn

•

Glen W. Clark has been elected president and a director of **Mississippi River Fuel Corporation** succeeding **William G. Marbury,** and Marbury has been elected chairman of the board of Mississippi. Clark has been president of the Cities Service Gas Company, a subsidiary of the Cities Service Company, and has been a member of the board of directors of the parent company. Clark also served as president of Cities Service Gas Development Company. Marbury will act as chief executive officer in his capacity as board chairman. He became president of Mississippi in 1949 after serving as vice president.

•

William Henry Bruyere of Houston recently joined **Houston Contracting Company** as assistant to management. Bruyere spent about nine years with American Oil Pipeline Company (formerly Pan American Pipeline Company), Houston, the last six years as chief engineer. His experience in the pipe line field includes planning, designing, coordinating, constructing and testing of pipe line facilities. Bruyere spent two years as an air conditioning and refrigeration application engineer for Carrier Corporation in New York.

W. H. Bruyere

•

The Buckeye Pipe Line Company has announced the following personnel changes: **Charles Ashmun,** formerly supervisor of oil movements at Lima, Ohio, has been appointed assistant to the president at New York; **John W. Scanlon,** formerly assistant supervisor of oil movements, appointed supervisor of oil movements at Lima; **Donald R. Merriman,** formerly division engineer at Macungie, Penn., appointed assistant to the general superintendent at Lima; **Ernest R. Shearer,** formerly assistant superintendent, gathering lines, appointed assistant superintendent Cygnet division at Lima; **Charles R. Williamson,** formerly foreman of gagers, gathering lines, appointed assistant superintendent, gathering lines, at Lima, and **George A. Chilcote,** formerly engineer at Lima, appointed division engineer at Macungie.

•

The American Society of Civil Engineers has announced the membership of the executive committee of the newly-created Pipe Line division. They include **Eldon V. Hunt,** Calgary, chief engineer, Alberta Gas Trunk Line Company, chairman; **Arthur E. Poole,** Island Park, N. Y., president, Mallen Construction Company, vice chairman; **Joseph B. Spangler,** Houston, Transcontinental

BRADEN WINCHES ARE:

★ **SAFE:** Up to 50% more reserve pulling and holding power than ratings indicate.

★ **STRONG:** Engineered for ruggedness. All moving parts, such as worm gears, made of steel and bronze alloy.

★ **GUARANTEED:** All BRADEN "M" Series Winches are guaranteed against defective workmanship & material for 1 year from date purchased.

BRADEN Truck Winches are engineered with as much care as many more complicated machines. Special alloys make them lighter but special engineering combines minimum dimensions with maximum strength.

Sure-action controls and the patented Oil-Cooled, Fully Automatic Safety Brake make the operator's job easy and safe. Longer, dependable service under the most strenuous conditions make BRADEN your best truck winch buy.

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BRADEN WINCH COMPANY
P. O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches

Your Wickwire Rope Distributor and our metallurgist . . . work together for you

This metallurgist—who is responsible for the quality of our rope wire—is with your Wickwire Distributor every time he makes a call.

True, he's physically in his laboratory, supervising the thorough testing *of both ends of every coil* of wire to assure uniformity throughout the coil. But, whenever your Wickwire Distributor calls, he has the full assurance that metallurgists like this are constantly making sure that the product has the right chemical and physical properties to give long, dependable service.

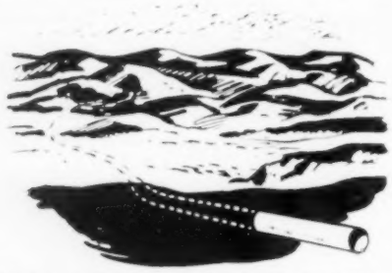
It's just one more reason why your Wickwire Distributor knows he's got top-quality wire rope, slings and strand to sell . . . and that these products will serve you well.

CF&I WICKWIRE ROPE A CF&I PRODUCT

4084

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

Gas Pipeline Company, secretary; **Fred C. Culpepper, Jr.**, Alliance, Ohio, project manager, Ford Bacon & Davis Construction Company, and **Stanton E. Huey**, Monroe, La., consulting engineer.



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C. O. Walker

Wayne Harris

C. O. Walker has been named division engineer in the Farmington, N. M., Engineering department of El Paso Natural Gas Company. Before his promotion, Walker was division field engineer. He started with the company in 1937 as chairman on a survey crew and was transferred to the Engineering department in El Paso in 1938. Walker was made field engineer in 1954. **Wayne Harris** has recently been named personnel representative for El Paso Natural's San Juan division with headquarters in the Farmington office. Harris joined El Paso Natural in 1947 as a laborer at Jal plant No. 2, was later plant clerk at the Jal warehouse. After transfer to construction as field office clerk, Harris was made field office manager of a pipe line spread. For five months he was transferred to Utah Natural as a pipe line inspector. When he returned to the company, he was general foreman for pipe line construction and in 1956 came to the home office. Another recent promotion at El Paso Natural was **J. B. Roach's** move from chief maintenance mechanic at McElroy-Crane plant, to chief operator at Permian division's Pembrook plant. Roach has been with El Paso Natural since 1945.

•

Robert C. Berry has been appointed treasurer of Trans-Canada Pipe Lines Limited in the Toronto office. He has been senior resident partner in the accounting firm of Deloitte, Plender, Haskins & Sells in the Montreal office.

•

E. Rue Thomas, Houston engineer and attorney, has joined **Trunkline Gas Company** as superintendent of gas supply. Thomas comes to Trunkline from Humble Oil & Refining Company, where for the past nine years he has served in various engineering capacities in the firm's Gas department. His experience includes engineering work in the fields of natural gas system and gasoline plant design and operation, gas sales contracting and work with the Legal department on Federal Power Commission regulatory procedures. At Trunkline, Thomas will be responsible for the conduct of gas supply activities.

E. Rue Thomas

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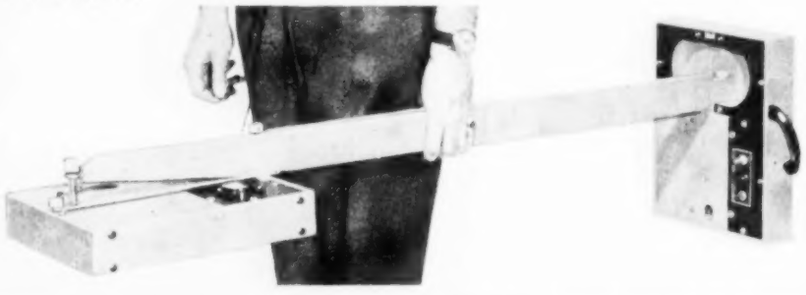
It will instantly locate all subsurface pipes, cables and such, and determine their depth too. The etched circuitry, our latest innovation, assures better quality control and performance than the customary hand wiring method. You can avoid damaged structures and loss of time with the Wilkinson Line Locator.



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Harry D. Hancock

K. E. Crenshaw

Cities Service Gas Company has announced the election of **Harry D. Hancock** as president to succeed **Glenn W. Clark,** who recently resigned to accept the presidency of Mississippi River Fuel Corporation. The board of directors of Cities Service also created a new post of executive vice president to which **Kirby E. Crenshaw** was elected.

Hancock, presently manager of the Natural Gas department of Cities Service Petroleum, Inc. with headquarters in New York, is known for his work related to development of high pressure, large diameter pipe lines for long distance transportation of natural gas. He received the American Gas Association distinguished service award in 1947 and its award of merit in 1953. Hancock has been with the Cities Service system since 1917, becoming president and director of Gas Advisers, Inc., a Cities Service subsidiary in 1938.

Crenshaw joined Cities Service in 1930 as a junior engineer in Bartlesville, Okla.

•

D-X Sunray Oil Company has announced the retirement of **L. W. Witte,** traffic manager, and appointment of **H. C. Lechner,** formerly assistant traffic manager, to this position. Witte completes 39 years of service. Witte joined the company in 1917 as rate and utility clerk. He was named traffic manager in 1947, after serving as assisitant traffic manager for a period of years. Lechner started in 1926 as rate clerk in the Traffic department, became chief clerk in 1929 and was named assistant traffic manager in 1941. Witte will remain in the company's general offices for several months in an advisory capacity. **J. T. Banks,** formerly rate clerk, will be named assistant traffic manager.

WHO'S MEETING WHERE

January

Pipe Line Contractors Association, Ninth Annual Convention, Boca Raton Hotel and Club, Boca Raton, Fla., Jan. 14-16, 1957.

American Institute of Electrical Engineers, 1957 Winter General Meeting, Hotel Statler, New York, Jan. 21-25.

February

NACE, Tulsa Section, Corrosion Short Course, Mayo Hotel, Tulsa, Okla., Feb. 13-15.

American Society of Civil Engineers, Pipeline Division, Jackson, Miss., Feb. 19-20.

March

American Society of Photogrammetry, American Congress on Surveying and Mapping, Shoreham Hotel, Washington, D. C., March 3-9.

NACE, 13th Annual Conference and Exhibition, St. Louis, Mo., March 11-15, 1957.

New England Gas Association, Annual Meeting, Hotel Statler, Boston, Mass., March 21-22, 1957.

Mid West Gas Association, Hotel Nicollet, Minneapolis, March 25-27.

April

NACE, Central Oklahoma Section, and University of Oklahoma Corrosion Control Short Course, Univ. of Okla. Extension Study Center, Norman, April 2-4.

Petroleum Equipment Suppliers Association, Palm Springs, Calif., April 6-11, 1957.

AGA Distribution, Motor Vehicles and Corrosion Conference, Rice Hotel, Houston, April 8-11.

American Welding Society, Sheraton & Bellevue Stratford Hotels, Philadelphia, April 8-12.

Southwestern Gas Measurement Short Course, College of Engineering, University of Oklahoma, Norman, April 16-18.

Southern Gas Association, Annual Convention, New Orleans, April 29-May 1.

May

AGA Gas Supply, Transmission and Storage Conference, Mark Hopkins Hotel, San Francisco, May 9-10.

ASME, 29th Annual Conference and Exhibit of Oil and Gas Power Division, Kentucky Hotel, Louisville, Ky., May 20-23.

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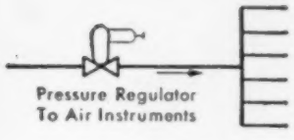

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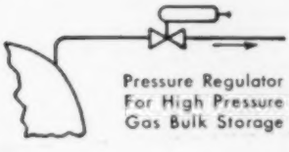
To Air Instruments



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For High Pressure
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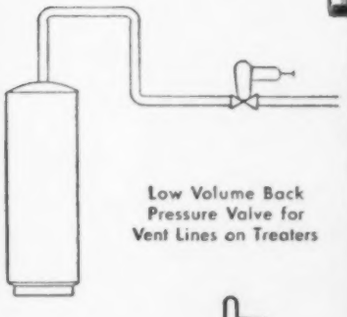
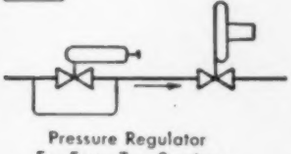


Low Volume Back
Pressure Valve for
Vent Lines on Treaters



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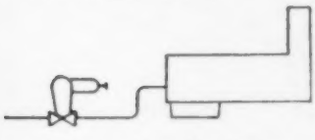

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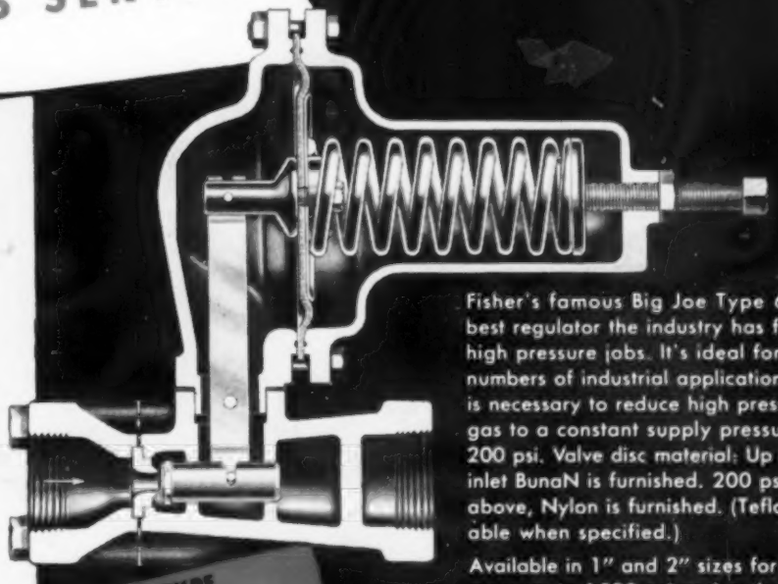
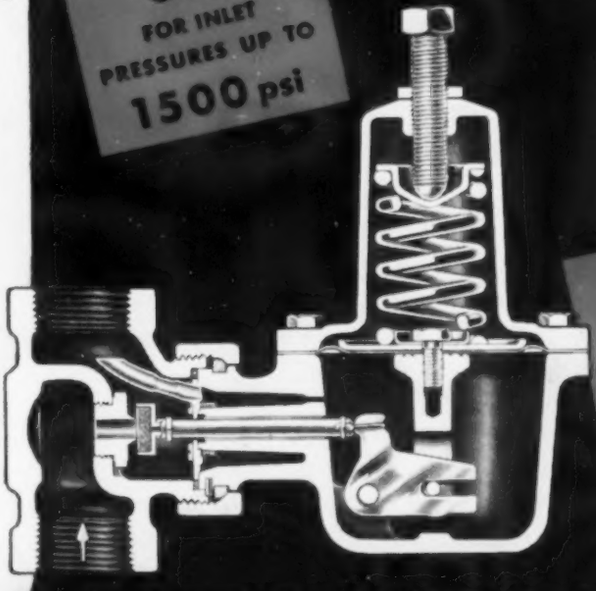


Fisher's famous Big Joe Type 630 is the best regulator the industry has for rugged high pressure jobs. It's ideal for countless numbers of industrial applications where it is necessary to reduce high pressure air or gas to a constant supply pressure of 5 to 200 psi. Valve disc material: Up to 200 psi inlet BunaN is furnished. 200 psi inlet and above, Nylon is furnished. (Teflon is available when specified.)

Available in 1" and 2" sizes for inlet pressures up to 1500 psi and outlet pressures 5 psi to 200 psi.

TYPE 630 FOR INLET PRESSURES UP TO 1500 psi



TYPE 620 FOR INLET PRESSURES UP TO 750 psi

For real economy the Fisher Type 620 pounds to pounds regulator is used on same applications as 630 "Big Joe" where pressure and flow requirements do not exceed 750 psi and reduced pressure not above 100 psi.

For inlet pressures up to 750 psi with malleable iron or cast steel body; up to 150 psi with cast iron body. Outlet pressure ranges: Type 620—3 to 60 lbs. (4 springs). Type 621—3 to 100 lbs. (5 springs). Valve disc material: BunaN when inlet pressure is 300 psi or less, and Nylon when inlet pressure exceeds 300 psi.

Sizes: ¾", 1" and 1¼" with cast iron or cast steel body.
¾" and 1" with malleable iron body.

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LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

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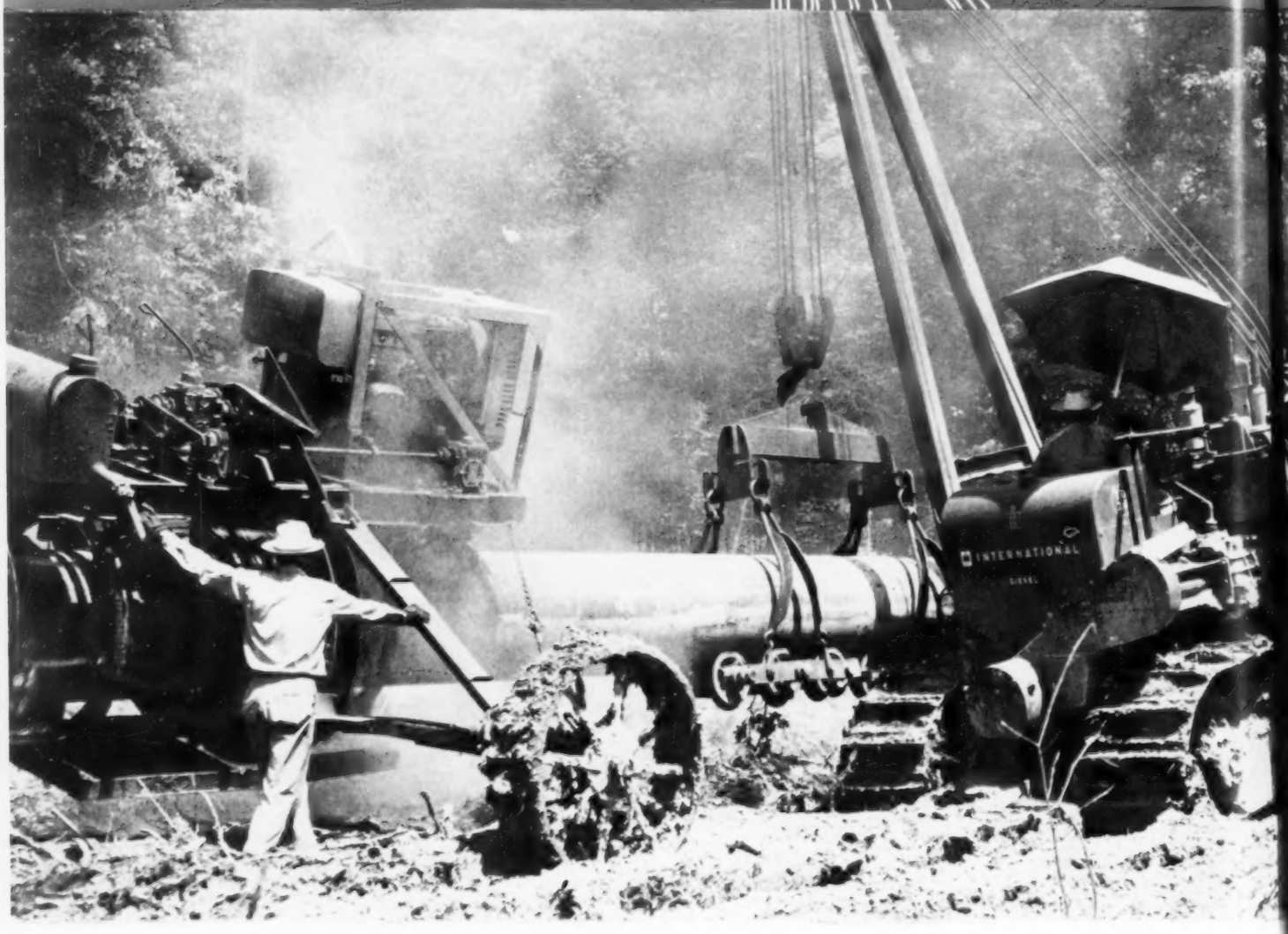
International® Superior TD-24

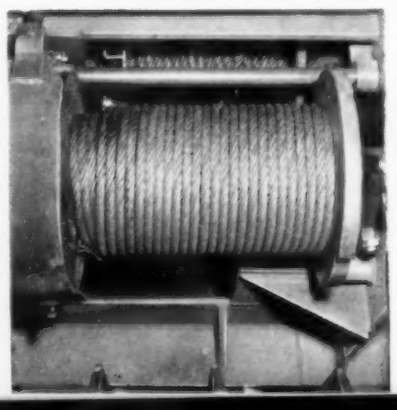
give you these terrain-beating, job-speeding



EXCLUSIVE:

You get super-fast control with minimum operator effort — with International Superior Pipeboom reach-easy control lever clusters. Load line is fully enclosed in heavy box-section for maximum safety to operator. The rugged boxed cable guard also serves as a rigid frame cross-tie.

EXCLUSIVE:



You get wear-saving cable alignment — with individual drum shaft mountings to position the cable. This exclusive design increases sheave life, as well as providing straight line center-to-center cable pull from boom and load sheaves to drum.

4 pipebooms

advantages

EXCLUSIVE:

You get time-saving, capacity-adding maneuverability and load control that no other boom unit delivers—uphill or down! Exclusive International TD-24 Planet-Power steering is the reason. You "feed" full-time live power to both tracks to insure *positive* steering and *positive* traction. Exclusive finger-tip hydraulic braking and foot decelerator add to positive load control.

EXCLUSIVE:

You get hour-saving, seconds-fast all-weather International gasoline conversion diesel starting – that conditions the TD-24's engine seconds-fast for full-diesel, full-capacity operation. Get up to 15% *bonus pipe-laying time daily* in cool weather, especially, with this fast, genuine, in-seat push-button starting!

EXCLUSIVE:

You get a big mud-beating margin of flotation—because TD-24 boom units put 14% to 18% less poundage psi on the tracks than other makes. With this extra *flotation-traction*, TD-24 Superior pipebooms keep handling big loads on boggy ground, without tipping or miring!

EXCLUSIVE: You get exclusive choice of direct gear drive TD-24 (190 hp) or torque converter model (200 hp). Also, you have a choice of a top hinge counterweight model (90,000 lb. lift) or a bottom hinge counterweight model (110,000 lb. lift).

On any cross-country pipe-lining spread you put together, these big International TD-24 Superior pipeboom exclusive advantages can tremendously affect your job profit sheet! Compare how new bonus-powered International Superior TD-18, TD-14, and TD-9 pipebooms outperform any other units in their size classes. Why be satisfied with anything less than International Superior performance? See your distributor for a demonstration of the International Superior boom and tow equipment your spread needs!

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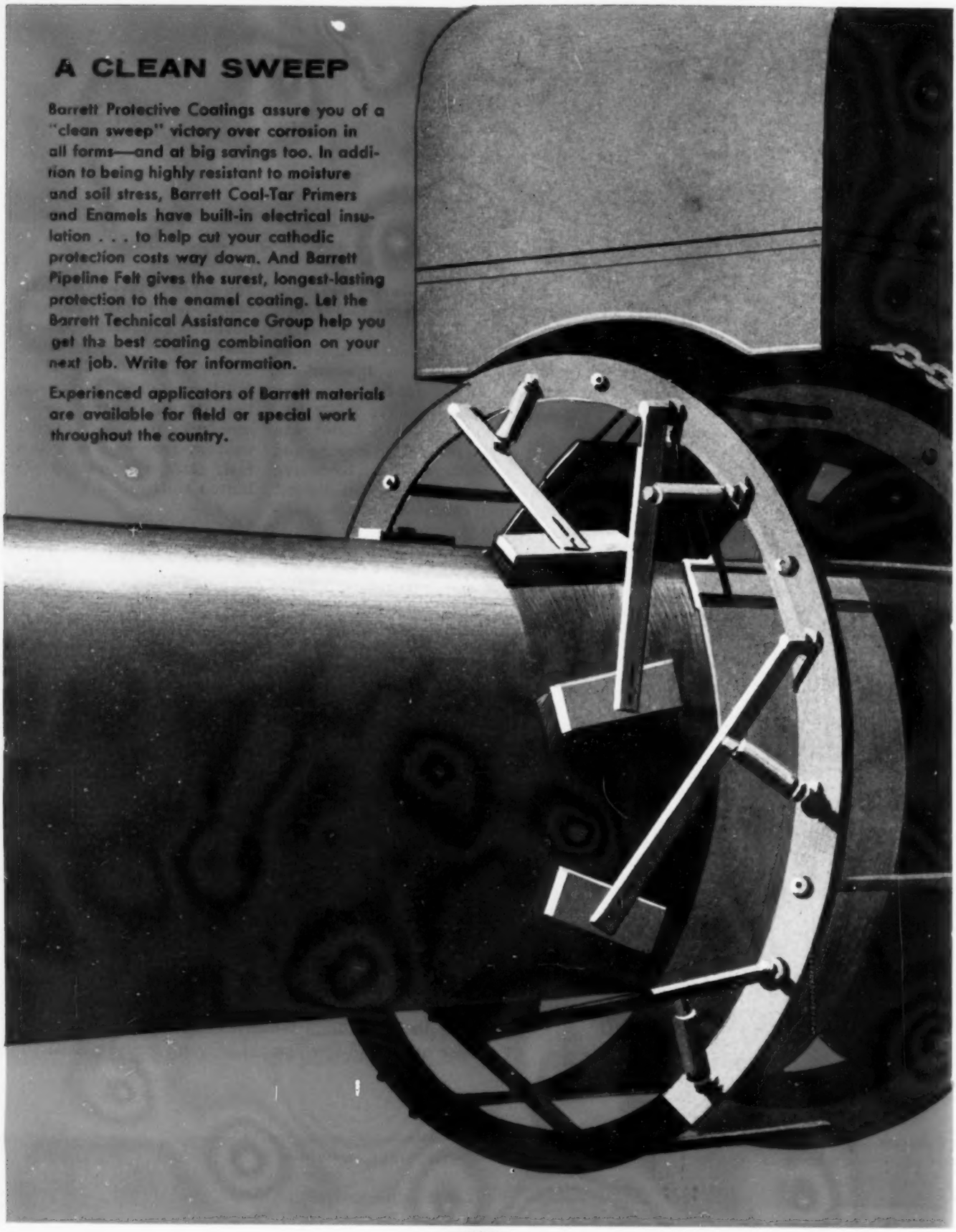

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Barrett Protective Coatings assure you of a "clean sweep" victory over corrosion in all forms—and at big savings too. In addition to being highly resistant to moisture and soil stress, Barrett Coal-Tar Primers and Enamels have built-in electrical insulation . . . to help cut your cathodic protection costs way down. And Barrett Pipeline Felt gives the surest, longest-lasting protection to the enamel coating. Let the Barrett Technical Assistance Group help you get the best coating combination on your next job. Write for information.

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OVER 100 YEARS OF EXPERIENCE

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What's Happening

AMONG SERVICE AND SUPPLY MEN

J. P. Humphrey

R. B. Reynolds

Taylor Instrument Promotes Reynolds and Humphrey

Robert B. Reynolds has been named industrial sales manager of Taylor Instrument Companies' Chicago branch and John Humphrey has become manager of the company's office in Philadelphia.

Reynolds joined the Taylor organization in 1940, immediately upon leaving college, and formerly functioned as industrial salesman in the San Francisco territory and later as assistant regional industrial sales manager in Chicago. During the last year he has been district manager in the company's Philadelphia office. He is a specialist in many types of control instrumentation, including instruments for oil and gas control.

Humphrey became a member of the Taylor sales staff dealing with petroleum processors in 1938. He worked out of the company's Philadelphia and Wilmington sales offices.

Both promotions were made in a general reassignment of responsibilities undertaken to increase the company's effectiveness in dealing with added administrative and sales activities.

Emsco Continues Operation As Division of Youngstown

The Youngstown Sheet and Tube Company of Youngstown, Ohio, principal stockholder of Emsco Manufacturing Company of Los Angeles, has purchased all of Emsco's properties, assets and rights and assumed all the obligations and liabilities of the company under a plan of reorganization approved by Emsco's stockholders in a special meeting held October 30, 1956.

All business conducted by Emsco Manufacturing Company will hereafter be conducted in the name of Emsco Manufacturing Company, a division of The Youngstown Sheet and Tube Company. The Johnston Pump Company division of Emsco Manufacturing Company at Pasadena, California, will continue its operations as Johnston Pump Company, a division of The Youngstown Sheet and Tube Company.

No change in sales, operating or personnel practices is presently contemplated by The Youngstown Sheet and Tube Company at either the Emsco or the Johnston Pump Company divisions. The businesses will operate in the same manner as prior to the reorganization, announced William T. Powell, president of the Emsco and Johnston Pump divisions.

Promotion of Burnett Announced by U. S. Steel

Erwin F. Burnett has been named manager of Commercial Research section of the Dallas headquarters office of U. S. Steel's Oil Well Supply division.

Burnett succeeds Neal K. Schnaitter, who has been transferred to the United States Steel Products division of U. S. Steel as assistant to vice president—sales in the division's New York office.

Burnett was employed by "Oilwell" in 1947 in Houston. In the following year he was transferred to Dallas as assistant to manager of drilling equipment sales, the position he held until 1950, when he obtained a leave of absence to serve in the U. S. Air Force.

Burnett returned to "Oilwell" in 1953 as assistant to manager, commercial research, the position he held prior to his present appointment.

Germany to Remain President Of Lone Star Steel Company

E. B. Germany, president of Lone Star Steel Company, has accepted a five year contract to continue in his present capacity. C. E. Owen, board chairman, said the board has voted to tender Germany a five year contract from September, 1956.

Germany is a charter member of the Lone Star Board. He has led Lone Star during a growth period in which the company has become the nation's seventh ranking producer of oil country line pipe, casing and tubing.

C. A. Ernst Joins Rockwell As Pittsburgh Personnel Head

Charles A. Ernst, former assistant personnel manager of Sheffield Corporation, Dayton, Ohio, has joined Rockwell Manufacturing Company as headquarters personnel manager in Pittsburgh.

Charles A. Ernst

A native of Dayton and 1940 graduate of Ohio Wesleyan University, he served as personnel director of Sinclair College, Dayton, before joining Sheffield in 1950. He majored in personnel administration and economics at Ohio Wesleyan, later received specialized training at Sinclair and the University of Dayton.

Mohun Heads Manufacturing At Baldwin-Hill Company

Appointment of John L. Mohun to the new post of general manager of manufacturing has been announced by Baldwin-Hill Company. Mohun will be in charge of production facilities at all four of the company's plants, which are located in Trenton, N. J., Huntington, Ind., Kalamazoo, Mich., and Temple, Texas.

Mohun was previously general sales manager, Industrial Insulation division, and before that he was general manager of the company's Southwest division with offices in Temple. Prior to joining Baldwin-Hill Company he was associated with the Union Asbestos and Rubber Company for 12 years, as sales manager, Industrial Insulation division.

Allen Cathodic Announces Tulsa Warehouse Opening

Allen Cathodic Protection Company, Inc., Houston, has announced the opening of a new Tulsa sales office and warehouse facilities for Polyken protective coatings.

R. N. Van Arsdale

Heading the Tulsa office will be R. N. Van Arsdale. Prior to becoming affiliated with Allen, Van Arsdale was associated with Marshall Supply and Equipment Co. of Tulsa.

The Tulsa warehouse has been opened to enable users of Polyken wrappings in the Oklahoma-Kansas-Missouri area to get immediate delivery on all orders.

Austin Company to Build New Johns-Manville Plant

Contract for the construction of a Transite asbestos-cement pipe plant for Johns-Manville Corporation at Denison, Texas, has been let to The Austin Company.

Construction is expected to be completed in 1957 or spring of 1958. The Denison plant will be Johns-Manville's seventh Transite pipe plant in the U. S. and Canada and is part of a $40 million Transite asbestos-cement pipe expansion program started by the firm this year.

Nelson Electric Manufacturing Formally Opens New Plant

Guests of Nelson Electric Manufacturing Company attended the formal opening of the company's new million dollar plant and offices in Tulsa recently.

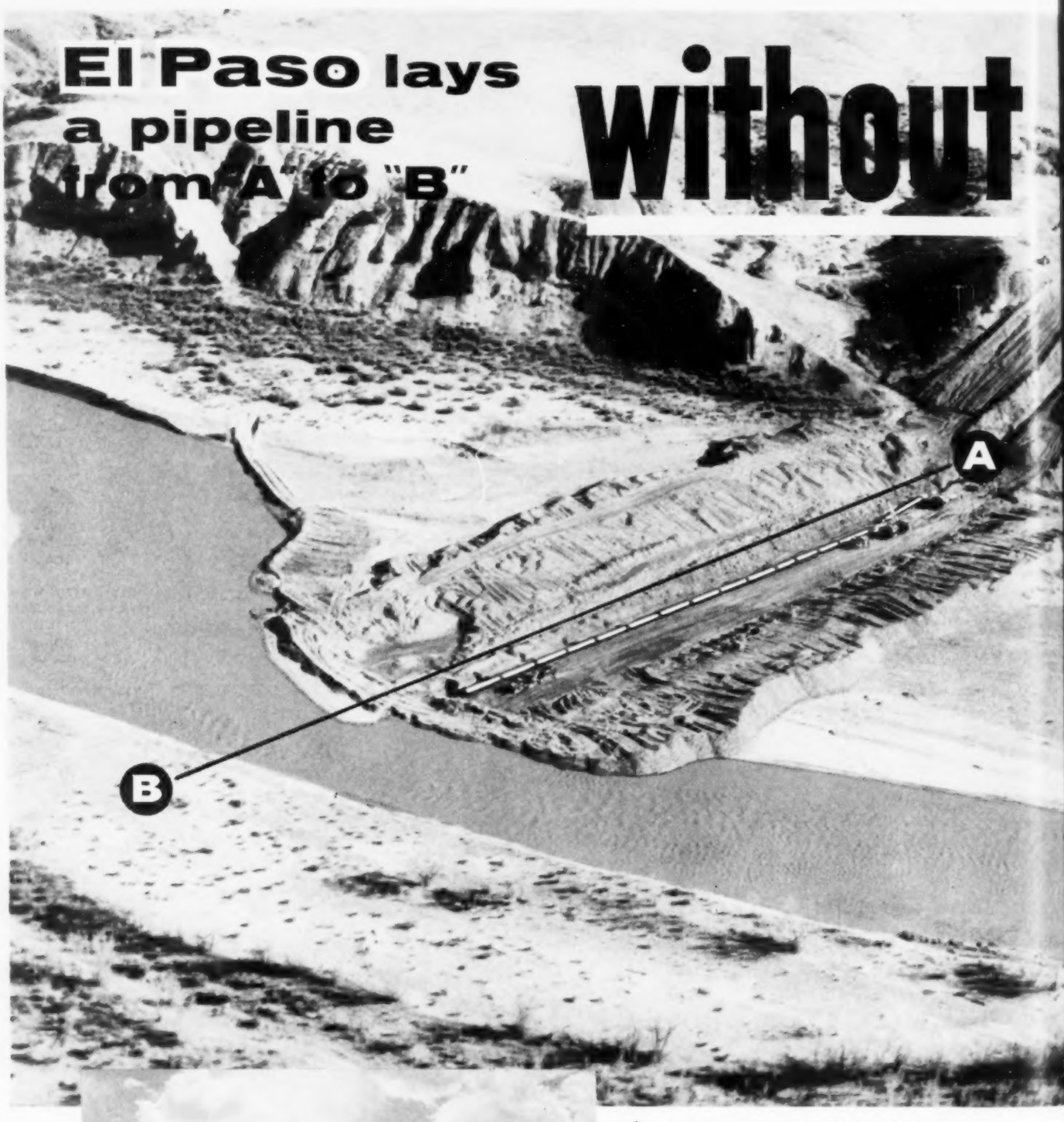
The new plant building has a high center bay in which is located a 10-ton travelling crane for ease in moving heavy equipment and materials. Provisions are made to allow railroad cars to be loaded and unloaded inside the plant. A special feature is a leveling floor for the assembly of switchgear to allow accuracy in assembly and adjustment. Production department offices are in a special mezzanine section at the west end of the plant where a view of all operations is available.

Oil Well Supply Announces Appointments of Mundy, Parks

Appointment of James B. Mundy and Charles D. Parks as field representative for U. S. Steel's Oil Well Supply division has been announced.

Mundy, who joined Oilwell in 1954, is

El Paso lays a pipeline from "A" to "B" without



▲ El Paso spreads cross the San Juan river in northern New Mexico. Pipe was first laid to the edge of the main channel. Then an earthen dam was built upstream. Water flow shifted over the section of line near the far bank and the 800-foot crossing was completed. Trench depth averaged 20 feet, pipe was anchored every 40 feet with tie-down clamps bolted 9 feet deep in the shale.

◀ Laying the 34-inch pipe across the red desert of the Navajo Indian Reservation of Northern New Mexico.

From San Juan, New Mexico, the line travels across the red desert of the Navajo Indian Reservation of Northern New Mexico and through the Foothills of the San Francisco Mountains in northern Arizona near Flagstaff. Near Holbrook, Arizona, it extends under the little Colorado River (approx. 500-ft. crossing). At its terminus, the line stretches 1,100 feet across the Colorado River on a pipeline suspension bridge being built jointly by El Paso and Pacific Gas and Electric Company. ▶

For more data on advertised products, use Readers' Service Cards, last page.

crossing the river!

THEY PUSHED THE RIVER ASIDE! El Paso Natural Gas Company laid their line to the edge of the main channel first, then temporarily diverted the river and used dry land methods to lay the pipe through the main channel. El Paso spreads report the crossing went without a hitch, and was less expensive than going under or over the river by usual methods.

Completed line to increase capacity by 450,000,000 cubic feet per day

Taking approximately 350,000,000 cubic feet daily from the San Juan Basin and another 100,000,000 cubic feet from the Permian Basin, the San Juan-Topock project, as it's called, will increase the company's total deliveries to over two and one-third billion cubic feet daily. Begun in early 1956 and scheduled for completion in early 1957 the new line will supply an additional 350 million cubic feet daily to customers in California and an additional 100 million cubic feet daily to customers in Arizona, New Mexico, Texas and Nevada. The 34-inch line, for the most part, will loop two existing lines (24 and 30-inch) which extend from the San Juan Basin to Topock on the California border.

A. O. Smith supplying 34-inch pipe for two-thirds of 338-mile project

Approximately 224 miles of 34-inch pipe was shipped to El Paso spreads from A. O. Smith Corporation of Texas' plant at Houston. For almost 30 years A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is in nearly every important high-pressure line.

Through research A.O. Smith *. . . a better way*

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CORPORATION

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For more data on advertised products, use Readers' Service Cards, last page.

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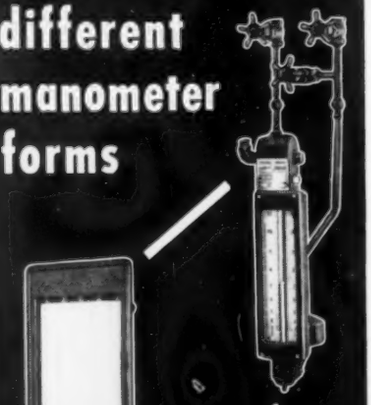
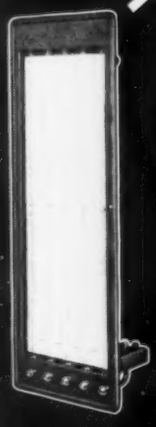
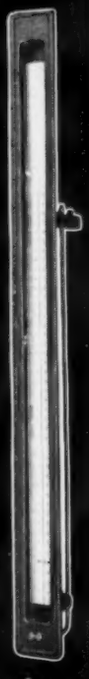


for flows



for pressures



for vacuums

Add to the uncompromising accuracy of Meriam Manometers the availability of a specific form most suited to the application. The result is simple, practical and permanently accurate instrumentation . . . at lowest cost . . . for every process and laboratory need.

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Meriam Manometer Instrumentation

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W-K-M Plant Tour

Approximately 45 persons attended the recent School of Pipe Line Technology sponsored by the API Transportation Division in Baytown, Texas. Personnel taking the six weeks course were pipe line and refinery executives, superintendents and engineers, including students representing pipe line operations of Iran, Brazil and Bolivia. A tour of the W-K-M plant at Missouri City, Texas, was one of the plant visits made during the course.

now field representative at Healdton, Okla. Parks is transferred to Shreveport, La., from his former post at El Dorado, Ark., where he has been employed since 1951.

Dresser Names T. L. Vance Sales Representative in Dallas

Dresser Manufacturing division of Bradford, Penn., announces the appointment of Thomas L. Vance as southwestern sales representative for the gas industry with headquarters in Dallas.

Vance has represented Dresser in southern California for the past three years. In his new post, Vance will serve users of Dresser pipe joining and repair products in Texas, Louisiana, Arkansas and New Mexico.

Stern Named Assistant Manager Of Research Lab in California

Dr. David Stern has been named assistant manager of the Whittier (Calif.) Research Laboratory of American Potash & Chemical Corporation.

Stern previously had been head of the research lab's Electrochemicals section since he went with the company in April, 1955.

Prior to joining AP&CC, Stern was with Western Electrochemical Company which later became a part of American Potash & Chemical Corporation.

Franz Reelected President Of Colorado Fuel and Iron

The Colorado Fuel and Iron Corporation has announced the reelection of A. F. Franz as president.

Other officers also reelected are Carl W. Meyers, vice chairman; A. C. Bekaert, vice president—finance; Franklin Berwin, vice president; F. S. Jones, vice president—sales; J. J. Martin, vice president—operations, Western division; Hubert C. Smith, vice president—operations, Eastern divi-

NOTICE: Specify PELCO Welding Saddles

No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

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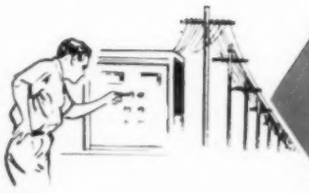
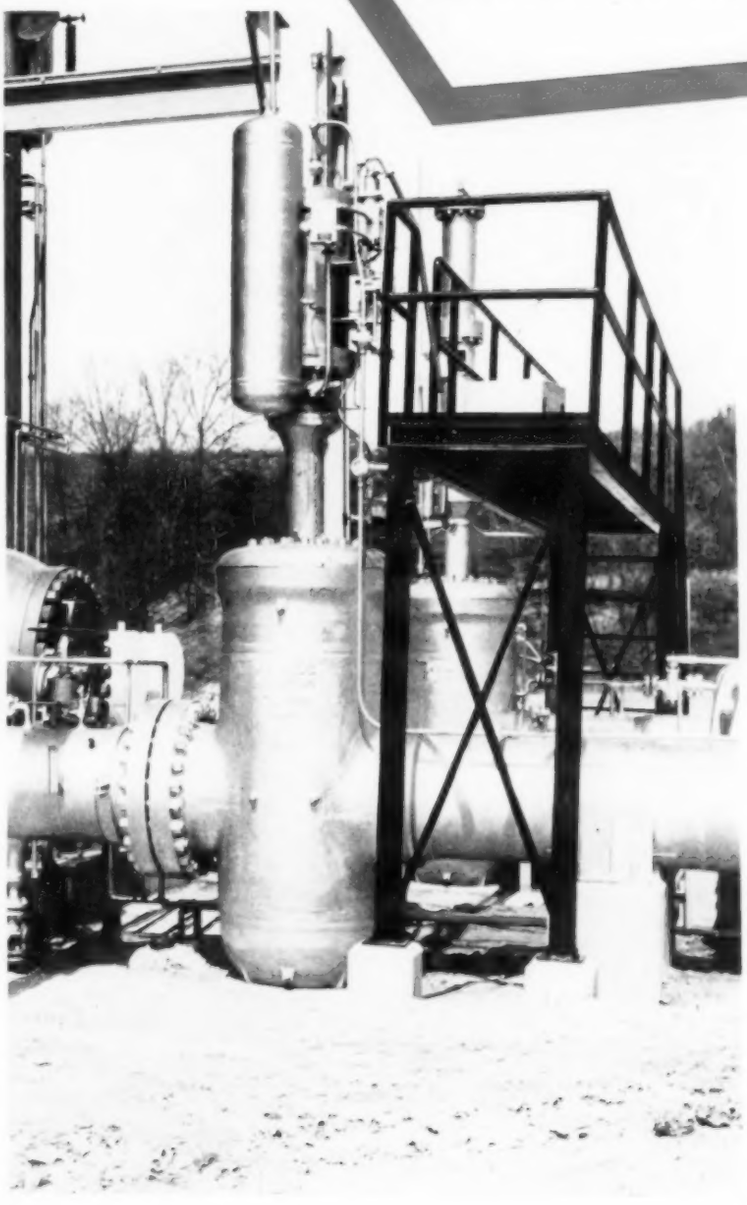
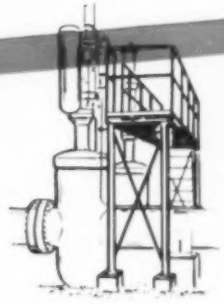
W-K-M

Dependability...

VITAL IN GULF INTERSTATE'S FULLY AUTOMATIC COMPRESSOR STATION







Completely dependable valve operation is of the utmost importance in this remotely controlled, fully automatic compressor station. These valves, operated from a station 80 miles distant, must open or close at the push of a button. The parallel expanding gate in W-K-M valves is the best possible insurance for dependable operation. Before moving into open or closed position, the gate segments are positively contracted by the exclusive LEVERLOCK and held in this position, assuring free and easy movement of the gate. Expansion of the gate segments against both upstream and downstream seats provides a positive double seal. Their Through-Conduit provides full volume, free flow . . . offers no more pressure drop than an equivalent length of pipe . . . sets up no turbulence. The right ratio of port opening to closing speed prevents dangerous line surges.

For the ultimate in dependable performance with minimum maintenance all along the line, specify W-K-M Pipeline Valves. Write today for your copy of the new W-K-M Pipeline Valve Catalog 300.

W-K-M 24" ASA 900 Pipeline Valves on suction and discharge lines of station.

W-K-M

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5608

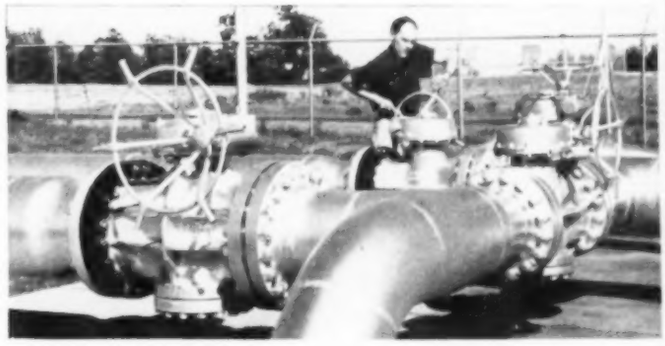
THESE VALVES SAVE

OPERATING DOLLARS

. . . reduce maintenance and down time costs

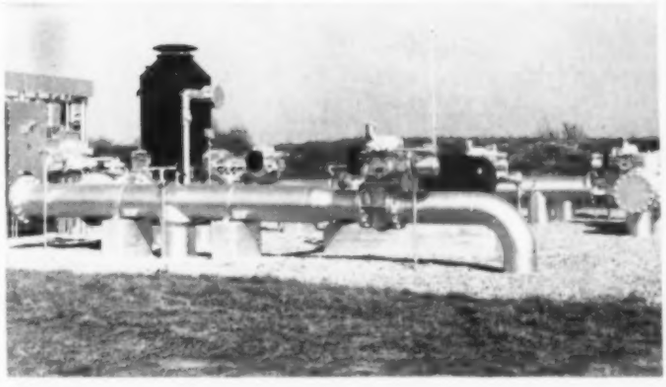
GAS PIPELINES

For forty years, pressurized lubricant sealing in Rockwell-Nordstrom valves has proven the safest way to control natural gas. And lubricant sealing *stays* safe . . . a turn of the lube screw provides a new seating surface *instantly*. Reseating costs and down time are lower than with any other valve.



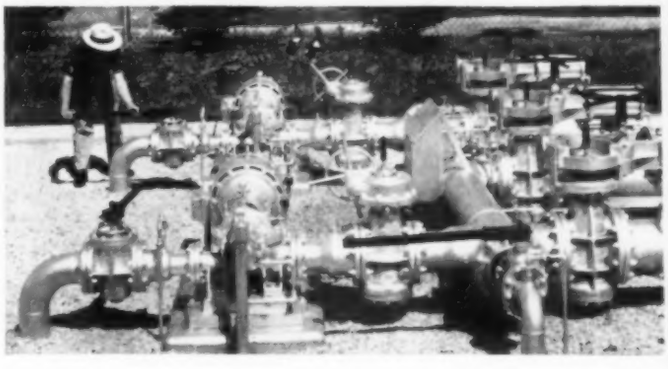
CRUDE PIPELINES

Quarter-turn operation in Rockwell-Nordstrom valves means faster, smoother closure at any pressure. Straight-through flow prevents packing and seat fouling (Rockwell-Nordstrom valve seats are *never* exposed to line fluid). Also, the firmly seated plug and rugged construction prevent costly shock load failures on pulsating flow.



PRODUCTS PIPELINES

Tight manifolding is easier with *compact* Rockwell-Nordstrom valves. Product contamination is eliminated by leakproof, positive shut-off. And lubricant prevents metal-to-metal friction wearing to slash maintenance costs. For power operation, quarter-turn, lubricated closure means simpler, less costly actuators.



Rockwell-Nordstrom valves are available in a complete range of sizes and pressure ratings for every pipeline need. We'll be glad to send you more information on how you can stay on stream at lower cost with Rockwell-Nordstrom pipeline valves. Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania. *Canadian Valve Licensee:* Peacock Brothers, Limited.

Available at leading suppliers . . . everywhere

ROCKWELL-Nordstrom VALVES

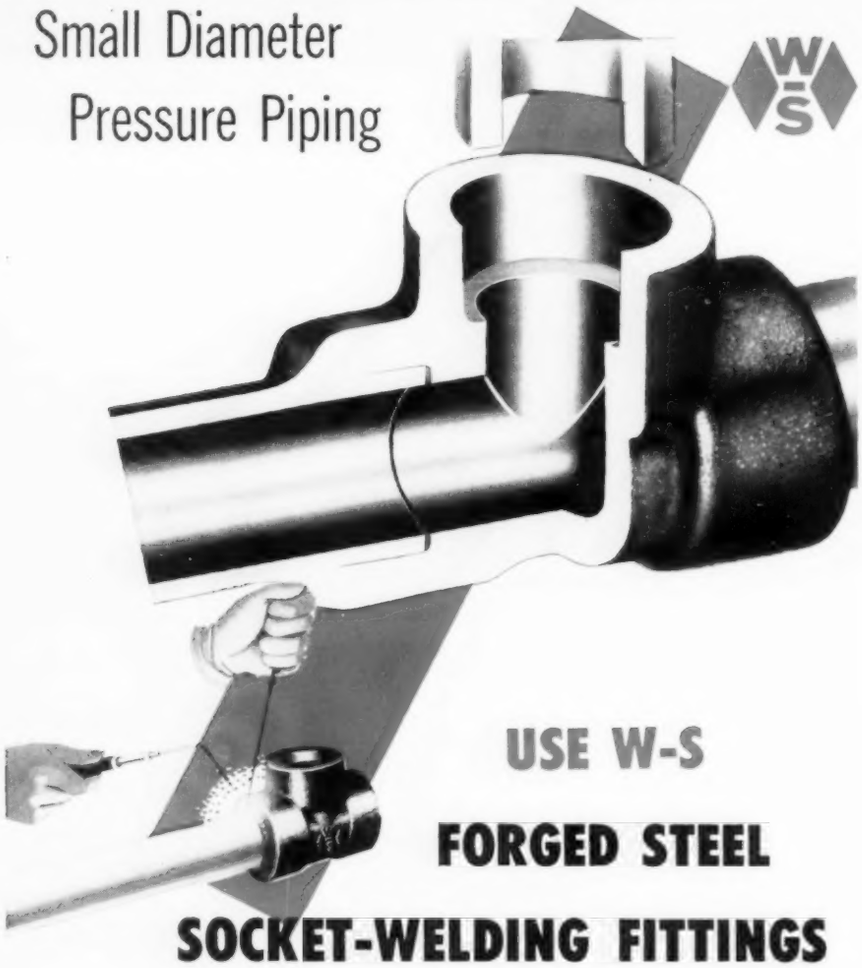
Lubricant Sealed For Positive Shut-Off

40th YEAR *of lubricated plug valve leadership*

Here's the **EASY WAY TO WELD**

Small Diameter

Pressure Piping



USE W-S

FORGED STEEL

SOCKET-WELDING FITTINGS

In addition to providing high strength and toughness, W-S Forged Steel Socket-Welding Fittings are also easy to install. Deep sockets support and align the pipe for welding . . . eliminating the need for tack welding or special fixtures. No back-up ring is needed either. The fillet-weld is completely outside the pipe. Welding icicles just can't form inside the pipe. The result is a clean, tight welded joint that will readily resist high pressures and the stresses of shock and vibration. What's more, installation costs are lower.

W-S Socket-Welding Fittings are available in sizes ⅛" to 4" for schedule 40, 80, 160 and double-extra heavy pipe in carbon steel, stainless steels and alloy steels.

For complete information on the installation and operation advantages of W-S Forged Steel Socket-Welding Fittings, send today for Bulletin A-3-56.

W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey

sion; H. C. Allington, vice president—sales, Eastern division; H. C. Crou treasurer; D. C. McGrew, secretary; an Earl D. Page, controller.

Austin Joy Joins Sales Staff Of Brumley-Donaldson Company

Austin S. Joy has joined the sales sta of the Tube and Steel division of Brumley Donaldson Compan

Austin S. Joy

Joy has 16 yea experience in oil, g and water transmi sion. Formerly he w sales manager of th Bechtel Corporation Semastic division an sales manager of Pip Linings, Inc.

Joy will have h headquarters at th company's home o fices at Huntingto Park, Calif., and wil promote the sale o steel and tubula products of United Kingdom and Austra lian manufacture.

Clayton Manufacturing Names Distributor in California

The Clayton Manufacturing Co. has named Oil Heating Equipment Company of Gardena, Calif., as a distributor of Clayton steam generators and SUMMERAIRE portable space heaters in the oil industry in California. Oil Heating Equipment Co., is headed by Bob Fulkerson.

Bob Fulkerson

In addition, the company will distribute heat exchangers, pressure vessels, process equipment and other steel fabricated products used by the oil and chemical industries.

Worthington Elects Morrison Head of Mason-Neilan Division

F. Kenneth Morrison has been named president and general manager of the Mason-Neilan division of Worthington Corporation. Morrison succeeds Eldon Macleod, who is retiring after 43 years.

F. K. Morrison

Starting with the Mason Regulator Company in 1924 as a salesman, Morrison was promoted to general sales manager in 1927 and continued in that capacity after the merger with the Neilan Company in 1931. In 1933 he was elected vice president in charge of sale

Ralph White Heads Research For Spinco Division of Beckman

Appointment of Ralph S. White manager of research and engineering f the Spinco division of Beckman Instru

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Allis-Chalmers: HD-7, HD-10, HD-14, L & S
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'Phones Victor 2-2909

ments, Inc., in Belmont, Calif., is announced.

White transfers to the new Spinco post from Stamford, Conn., where he served as assistant manager of the Liston-Becker plant of Beckman's Scientific Instruments division.

White has been with the Beckman organization for six years. Prior to his Liston-Becker assignment, he served as chief administrative engineer for Beckman's Scientific Instruments division at Fullerton, Calif.

Cooper-Bessemer Promotes Matthews to Engineering Post

Promotion of J. P. Matthews to turbocharger application engineer is announced by The Cooper-Bessemer Corporation. Matthews will work directly under John Fullemann who presently directs all engineering development work on Cooper-Bessemer rotating equipment.

J. P. Matthews

Matthews has devoted his major efforts to Cooper-Bessemer's program of product improvement and expansion of its line of engines and compressors. Most recent of this activity has been the development of Cooper-Bessemer air conditioning equipment for turbocharging its 4-cycle engine.

DITCHER SALES PROMOTION MANAGER WANTED: Experienced man to head sales promotional activity of leading manufacturer of expanding ditcher line. Must have sales experience and be familiar with design and application of both wheel and boom type machines. Position involves overall sales management responsibilities with distributors and key customer contacts. Age preferably under 45. Management level compensation. Provide complete experience resume with application.

Reply to: **Personnel Director, Barber-Greene Company, Aurora, Illinois.**

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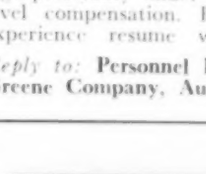
• ALLIS CHALMERS
• INTERNATIONAL
• CATERPILLAR
(New, Used, Rebuilt)



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Tremendous Savings
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For more data on advertised products, use Readers' Service Cards, last page.

What's New in Equipment

for the Pipe Line Industry

Pipe Cleaning Machine

A new self-propelled, rotating head pipe cleaning machine designed for use by maintenance crews working on loaded lines has been introduced by Remco Manufacturing Company. Perfected after two years of design and experimentation, Remco claims this new machine enables two men to clean up to nine times more pipe in one day than can be handled by such other methods as hand cleaning and rocker type cleaners. It eliminates the need for air compressors or electric generators.

Requiring only six inches of clearance under the line, the complete unit consists of a revolving head and a separate power plant which is easily mounted to the revolving head. Both the revolving head and the power plant on the larger models can be quickly mounted to the line by two men. Once the unit is mounted, it can easily be handled by one man.

The revolving head is adjustable to any required travel speed and uses standard cutters, knives or brushes.

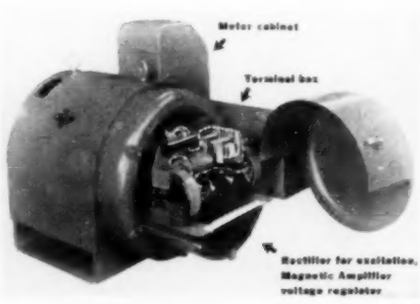
(This item supplements Remco Manufacturing Co., Inc. data on page 4279 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Generator

A new "Amp-Pak" packaged generator introduced by Electric Machinery Mfg. Company uses a built-in rectifier for excitation instead of a conventional rotating exciter and a magnetic amplifier voltage regulator, with no moving parts or vacuum tubes, to provide accurate response voltage regulation.

This static arrangement eliminates much of the maintenance required on conventional synchronous generators. There are no exciter brushes or commutator to maintain. The rectifier, located in the incoming air stream, needs nothing more than occasional blowing out to remove dust. The magnetic amplifier voltage regulator has no vibrating contacts, other moving parts or vacuum tubes and requires little maintenance.



All necessary components of the packaged generator, including the excitation system, voltmeter, ammeter and voltage adjusting rheostat are mounted on the generator itself so that all wiring between the generator and the exciter-regulator components is done at the factory instead of in the field.

"Amp-Pak" packaged generators are available in three phase ratings of 75-187 kva at 1800 revolutions per minute and 62½-187 kva at 1200 rpm. Output voltage may be 120/208, 240, 480 or 600.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Pipe Fitting

Bonney Forge has announced a branch welding pipe fitting for constructing angular branch connections with a full penetration weld. Bonney Elbolets are used for making 45 degree connections for directional flow and instrument connections, and for connections into elbows for instruments, drips, and hangar and support connections. Elbolets are available through stocking distributors of Bonney Weldolets and Thredolets.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Pipe Line Insulation

The Fiber Glass Division of Pittsburgh Plate Glass Company has announced the addition of pipe line wrap to its present line of fiber glass products. To be known as Pitt-Wrap, the pipe line insulation is available in both parallel-reinforced and non-reinforced types. A complete line of widths and lengths will be furnished. The glass mat is made from long fiber glass. Made from long fiber glass, the glass mat is said to possess excellent strength and can be held to close tolerances.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

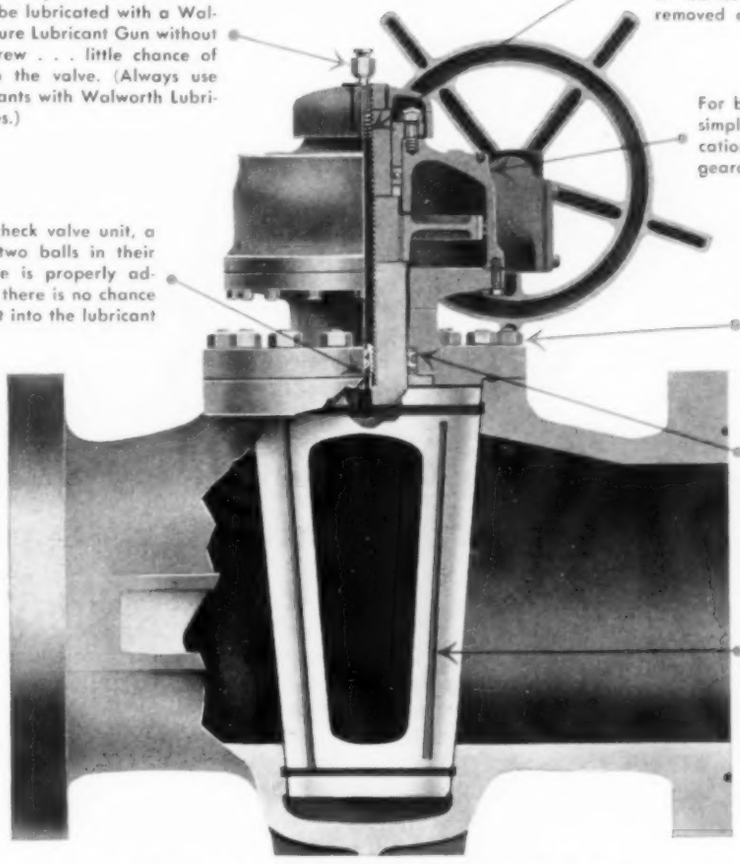
Let's get technical about WALWORTH LUBRICATED PLUG VALVES for pipeline service

Combination button-head lubricant fitting and lubricant screw is provided at no extra cost. Valves can be lubricated with a Walworth High Pressure Lubricant Gun without removing the screw . . . little chance of grit getting into the valve. (Always use Walworth Lubricants with Walworth Lubricated Plug Valves.)

An added safety feature in the form of a groove cut part way up side of the lubricant-fitting screw allows the operator to observe any tendency of lubricant to blow out before the screw is removed entirely.

For buried pipelines — yoke design permits simple attachment of handwheel and lubrication extensions without modifying the gearcase.

In the stainless steel check valve unit, a transverse pin holds two balls in their seats. When the valve is properly adjusted and lubricated, there is no chance for line pressure to get into the lubricant system.



Standard bolt threads, rather than fine threads, mean easy replacement of nuts and bolts from local stocks.

Two overlapping Teflon packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low breakout torque . . . plug turns easier. Packing serves only as a seal and is not used to hold the plug in its seat.

Lubricant grooves completely frame the port openings and encircle the plug at the top and bottom assuring a tight seal against leaks. Bottom circumferential groove is separate from, but connected with, the lubricant well.

Other Walworth Lubricated Plug Valves include Single Gland and Regular Gland types. Sizes to 30 inches. Pressures to 5000 psi. and for vacuum service.

Cutaway of a 24-inch Walworth Lubricated Plug Valve

Without exception, a Walworth Ball Bearing Lubricated Plug Valve is easier to operate and maintain than any other type of rotary-action, sealed valve available today for pipeline service. Design features pointed out here show just a few advantages of Walworth Ball Bearing Lubricated Plug Valves.

Many pipeline companies throughout the world use Walworth valves for handling gas, crude, and finished products. Investigate the line of Walworth valves for your own needs. See your Walworth Distributor, or write for literature: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

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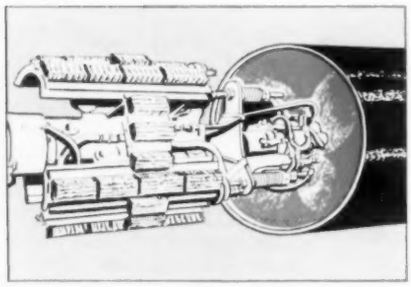
REPEAT PERFORMANCE

Copon internal pipe coating selected again by major gas transmission company



Thirty and thirty-six inch pipe being automatically spray-painted at mill following unique metal cleaning process.

Proof of COPON'S effectiveness in solving internal pipe coating problems lies in its growing acceptance by major gas transmission companies. This year it's being used again by one leading firm for new 30" and 36" pipeline construction in addition to many other projects.

COPON internal pipe coatings offer *even more* than outstanding protection against corrosion losses. They *pay off* in protection during storage, lowered maintenance expense and greatly reduced pigging costs. And COPON coatings make possible delivery of cleaner, rust-free gas products.

Scientifically developed systems are available for coating dehydrated gas lines, crude and petroleum product lines, salt water lines, fresh water lines, and oil well tubing and casing. Write your nearest COPON manufacturer today. He will be happy to show you how COPON can be efficiently applied to new pipe, used pipe or pipe-in-ground.

Get complete information about COPON today.

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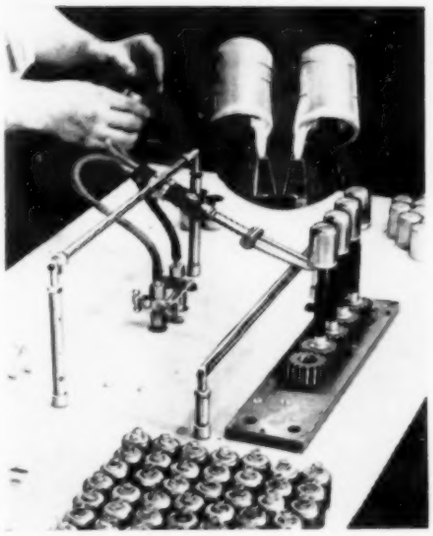
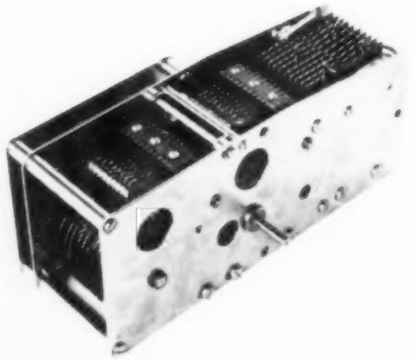


Heat Warner

Humphrey-Wilkinson, Inc. is producing a safety device called a heat warner. It comprises a brass cartridge filled with pungent gas or smoke under pressure. Used for years on railroad cars and now more widely offered to industry at large, it releases an acrid smoke when "hot boxes" or other friction points in machinery and expensive equipment develop dangerously high temperatures, warning of trouble before damage occurs. The shell and cap forming the cartridge must be gas-tight, resilient to severe vibration, shock and heat changes, along with corrosion-resistant.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.



Analog-to-Digital Converter

Fischer & Porter's shaft position, analog-to-digital converter, the Digi-Coder, is now available in a new C-2-B model. This advanced design Digi-Coder incorporates, at a lower cost, many new features, such as reduced inertia, wide range of AC and DC operating voltages and non-corrosive, precious-metal contacts. The latter may be used to make and break a circuit at 250 ma, 48 V DC or 115 V AC.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

THOUSANDS OF MILES OF LONE STAR LINE PIPE

prove It's your BEST BUY!

Lone Star electric weld line pipe has uniform wall thickness in every joint. Quick, accurate field-joint line-up and outstanding weldability . . . plus easy-to-bend characteristics . . . mean faster construction schedules. Plus value: year-after-year of trouble-free service.

Lone Star API line pipe, casing and tubing . . . made in Lone Star's ultra-modern plant . . . are quality-controlled from mining of the ore through the fine, finished products in the pipe mills. Lone Star is a completely integrated operation . . . dedicated to serving the oil and gas industries.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

Lone Star STEEL COMPANY

LSS

EXECUTIVE-SALES OFFICES
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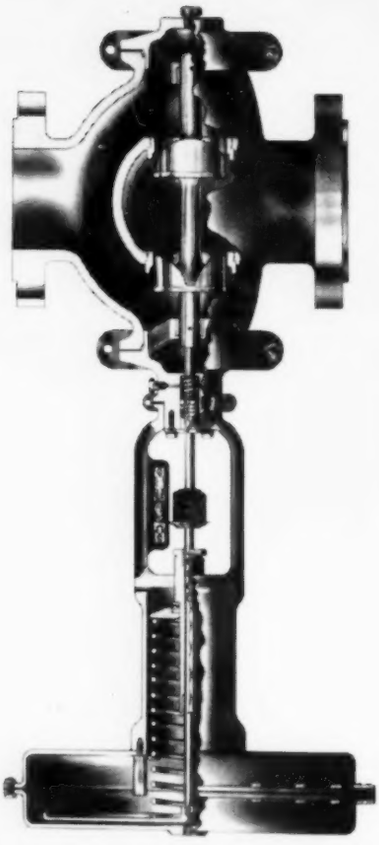
DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

REPAIR LEAKS
QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.

SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A.



tion test leads is being marketed by L & M Company. The junction box is cast in one piece with a marker vent and eliminates the need for all other signs, posts, return bends and junction boxes at road crossings.

Cast of heavy malleable aluminum alloy with the sign panel custom designed and painted to match company colors, the L & M marker vent is easy to install, corrosion resistant and cannot be shattered by rifle fire, rocks or other tools of vandalism. Tod Pazdral Pipe Line Specialties is the sole distributor for domestic and foreign sales.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

YOU DON'T Have to Put Up with Dirty and Inefficient Radiator Cooling Systems!

Use SAND-BANUM SPECIAL
In Handy Tablets
for ALL Radiator Cooling Systems – Stationary or Mobile.

Regular use of Sand-Banum Special maintains the cooling system free from rust, crust, sludge, dirt, oil, grease and lime; any and all clogging matter.

Remove and Prevent Boiler Scale with **SAND-BANUM** Pure Colloidal Concentrate

All Active Ingredients – Ounces Only Once A Week –

Stocked by Leading Supply Houses
GULF COAST DISTRICT REPRESENTATIVES
Western Sand-Banum Company
1717 Chenevert, Houston 2, Texas

AMERICAN SAND-BANUM CO.
ESTABLISHED 1926
MEADOW BROOK NATIONAL BANK BUILDING
FREEPORT, NEW YORK

Diaphragm Control Valve

Black, Sivalls & Bryson Inc. introduces a new line of diaphragm control valves, the "Super 70 Series" which includes a new topworks, redesigned valve body and an all-metal float ring seal.

The topworks features a new moulded diaphragm for uniform thrust over full valve travel, pressed steel cases for maximum strength with minimum weight, and a precision-calibrated single spring. The entire topworks is iridited and cadmium-plated for corrosion resistance. Topworks is available in direct or reverse acting styles and in four sizes.

The valve bodies feature new streamlined flow contours for greater stability, new top and bottom guided inner valves for more exacting flow characteristics, new all-metal float ring seal which provides self-actuating closure and tightens with application of pressure, new forged clamp ring that allows yoke orientation to any position, and bolted stuffing box with stainless steel followers. Valve bodies are available in three styles—single port, double port and split body for use in erosive or corrosive fluid service where easy removability of valve seat is desirable.

(This item supplements Black, Sivalls & Bryson, Inc. data on Pages 649-660 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E7** on Readers' Service Card, last page this issue.

Marker Vent

A new L & M marker vent with a built-in junction box for cathodic protec-

Enamel Primer

A new enamel primer recently developed by Koppers Company, Inc., will be of interest to gas distribution and oil and gas transmission companies. Called Bitumastic Jet-Set, the new coating material is designed for use where its fast-drying characteristics are of importance.

Under optimum conditions, conventional enamel primers take from 12 to 24 hours to dry completely enough for the application of enamel. Bitumastic Jet-Set, under the same atmospheric conditions, is ready for enameling after about one hour. Under adverse humidity conditions, the primer is ready for enameling in eight hours or less, compared to five days or longer for other primers under like circumstances. The use of Bitumastic Jet-Set will enable distribution and transmission companies to make repairs and back-fill rapidly, thus reducing inconvenience to the public and speeding their own operations.

Applied by brush or spray, Bitumastic Jet-Set has a recommended coverage rate of between 400 and 500 square feet per gallon. At this rate it will dry to touch in from one to 15 minutes. Field experience by the Koppers Contract Coating department has proved that Bitumastic Jet-Set permits work to continue where heretofore, enamel primers have necessitated shutdown due to their long drying time.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

Circle numbers on Readers' Service Cards on last page

for better pipeline performance
get the best in pipeline protection

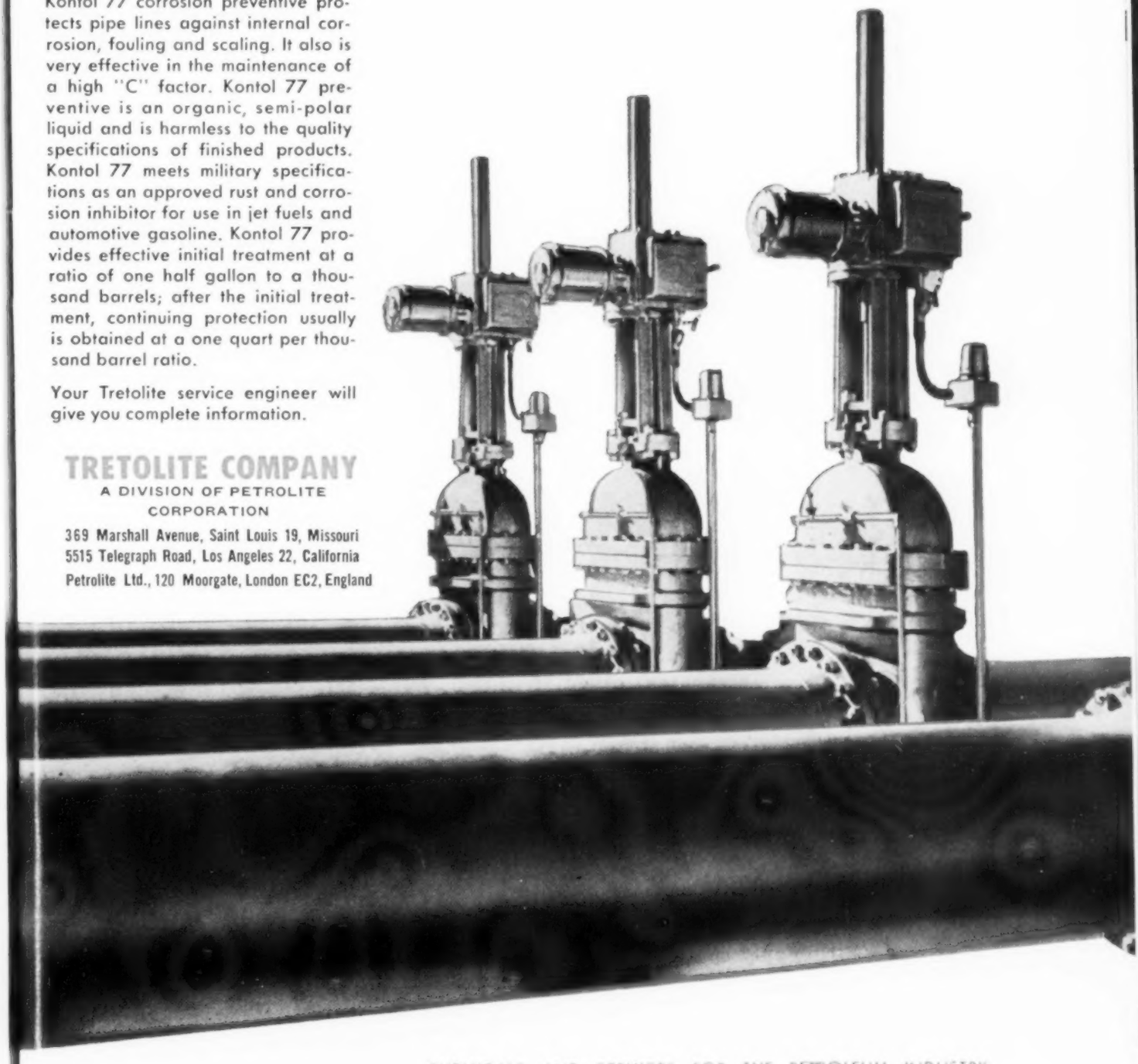
KONTOL® 77

CORROSION PREVENTIVE

Kontol 77 corrosion preventive protects pipe lines against internal corrosion, fouling and scaling. It also is very effective in the maintenance of a high "C" factor. Kontol 77 preventive is an organic, semi-polar liquid and is harmless to the quality specifications of finished products. Kontol 77 meets military specifications as an approved rust and corrosion inhibitor for use in jet fuels and automotive gasoline. Kontol 77 provides effective initial treatment at a ratio of one half gallon to a thousand barrels; after the initial treatment, continuing protection usually is obtained at a one quart per thousand barrel ratio.

Your Tretolite service engineer will give you complete information.

TRETOLITE COMPANY
A DIVISION OF PETROLITE CORPORATION
369 Marshall Avenue, Saint Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California
Petrolite Ltd., 120 Moorgate, London EC2, England



CHEMICALS AND SERVICES FOR THE PETROLEUM INDUSTRY

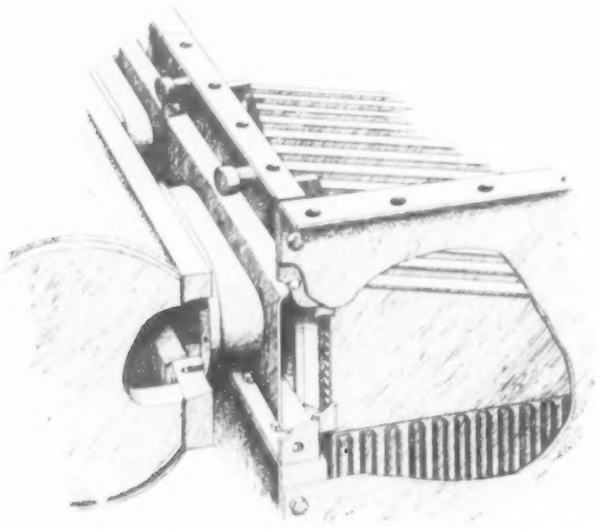
DEMULSIFYING, DESALTING, CORROSION PREVENTING, WATER DE-OILING, PARAFFIN REMOVAL, SCALE PREVENTING, PRODUCTION STIMULATING

how

a

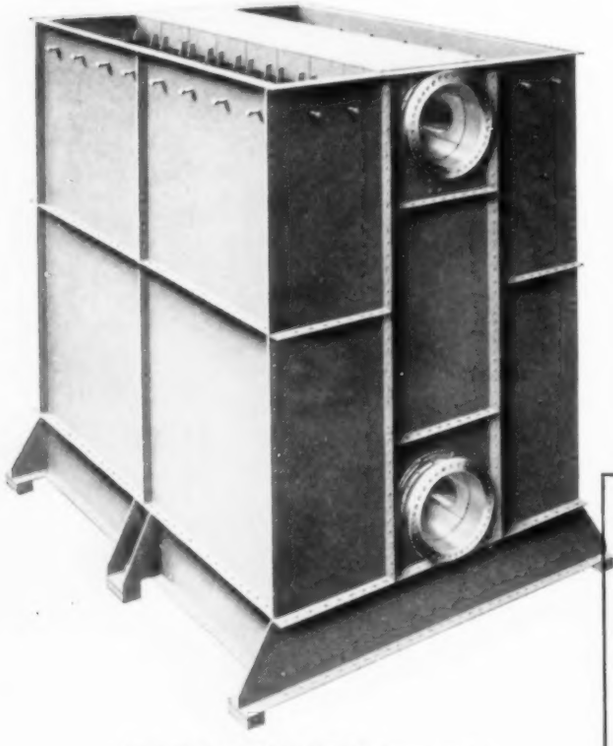
PIN-FIN

extended-surface regenerator



Detail sketch showing specially designed 'pin-like' shapes which greatly increase heat-transfer surface area.

adds to economy of gas-turbine operation . . .



Compact, light-weight PIN-FIN Regenerator unit.

REDUCED FUEL CONSUMPTION is a principal reason. For example, a 75%-effective Air Preheater PIN-FIN Regenerator in a gas-turbine cycle at 6 to 1 pressure ratio and a turbine inlet of 1500 F, will cut fuel consumption by about 32%.
And, just as important, is the fact that these regenerators need practically no maintenance. That's been proved by five years of actual field service. Get the complete story of what a PIN-FIN Regenerator can do for you – call or write the Air Preheater Corporation.

Mechanical Advantages of Air Preheater's PIN-FIN Regenerator...

- Compact
- Light-weight
- Quickly erected
- Minimum maintenance
- Convenient, one-unit design
- Easily disassembled

Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Tubing System Data

W. D. Wynant, Tube & Hose Fittings division, has issued a new booklet of information including charts and tables to aid in proper selection of tubing as to size, wall thickness and material for various operating conditions. Factors considered are flow requirements, pressures, severity of service and temperatures.

To get a copy, circle **No. E10** on Readers' Service Card, last page this issue.

Dravo Products

Dravo products and services for the oil and gas industry are presented in a new 20-page booklet by Dravo Corporation, Machinery Division. The bulletin illustrates many pipe line pumping and compressor stations that have been engineered and constructed by the corporation, including metering and regulating stations. Numerous shop-fabricated station and system piping applications are shown.

To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

Pneumatic Controllers

A 56-page bulletin describing the new Series 500W pneumatic controller has been announced by The Bristol Company. It contains more than 75 photos and drawings describing the new high sensitivity, wide control-band controllers for temperature, pressure, flow, vacuum, etc. Features of the new controllers mentioned include control bank width ½ percent to 400 percent, high sensitivity without loss of stability, precision linkage allowing reassembly and recalibration with only one adjustment and reset action stops.

To get a copy, circle **No. E11** on Readers' Service Card, last page this issue.

Reciprocating Pumps

The Aldrich Pump Co. is distributing a new bulletin on the Aldrich triplex (3 plunger), quintuplex (5 plunger), septuplex (7 plunger), and nonuplex (9 plunger) reciprocating pumps. It also describes and illustrates the Aldrich-Groff "Power-Savr" pump's straight-line control of capacity, from zero to rated output without any change in speed of power source. The catalog also presents dimension tables and a pump selection chart for the complete Aldrich line. It is designed as a quick reference source for engineers, production and management personnel.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

Shovel-Cranes

A new catalog of the Link-Belt Speeder line of shovel-cranes has been released by Link-Belt Speeder Corporation.

The new catalog features descriptions of 18 crawler-mounted models ranging from ½ to 3 yards, 8 to 75 ton capacities; five truck-cranes with capacities from 12½ to 35 ton; and four self-propelled, rubber-tired models with capacities from 15 to 35 tons.

To get a copy, circle **No. E12** on Readers' Service Card, last page this issue.

Arc Welder

The Lincoln Electric Company has issued a booklet on the new Lincolnweld, called "industry's most versatile submerged arc welder." Features of the Lincolnweld such as its universal head positioning, vertical adjustment, choice of electrode contacts, automatic flux valve, etc., are outlined. Lincolnweld attachments for every automatic need are illustrated and described. Types of Lincolnweld for AC and DC operation are included in the descriptive data.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Gas Dehydration Unit

A new gas dehydration unit for gas wells which uses calcium chloride pellets in a tower of patented design is described in a 16-page booklet issued by Fish Engineering Corporation, Manufacturing division.

To get a copy, circle **No. E13** on Readers' Service Card, last page this issue.

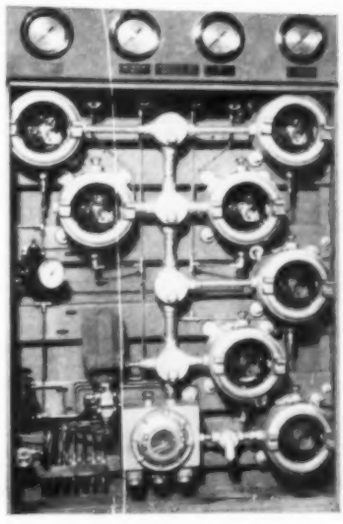
Cathodic Protection

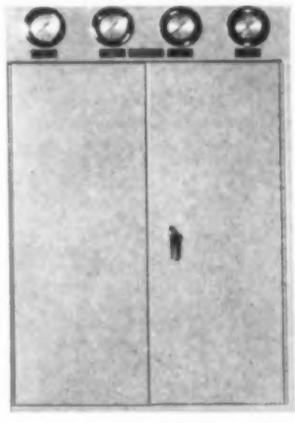
Corrosion Services Incorporated has published a brochure giving a quick look at the cathodic protection services and materials offered by the firm. It covers the engineering service, contract installation service, Dow magnesium anodes and other brand name cathodic protection materials.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Circle numbers on Readers' Service Cards on last page

PROTECTION
for
GAS TURBINES





MERCOID
SAFETY CONTROL
PANELS

Illustration above is a typical custom made explosion proof Mercoid Safety Control Panel which safeguards Gas Turbines by providing the following control functions:

Clutch pressure • High pressure lube oil • Axial compressor discharge • Bearing lube oil pressure • Fuel supply pressure • Overspeed pressure • Impeller pressure • Starting turbine throttle pressure • Lube oil high temperature • Exhaust temperature shutdown • Exhaust temperature alarm.

There are many more safety functions Mercoid can provide—our engineers will be pleased to offer their recommendations on the proper application of Mercoid Safety Controls for your gas turbines.

Write for details

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

Advertisers' Index

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GUNITE COATINGS for PIPE LINES

Reinforced GUNITE COATING being applied to pipe.

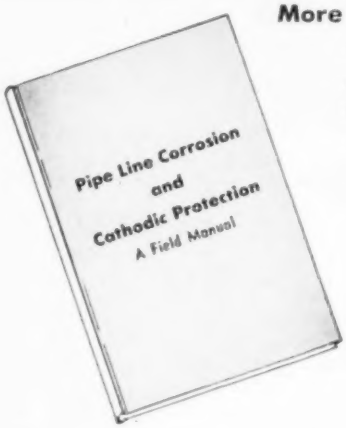
Your inquiry solicited.

GUNITE CONCRETE & CONST. CO.

1301 WOODSWETHER RD., KANSAS CITY 5, MO.
3206 HOUSTON, HOUSTON 9, TEX.
CHICAGO – ST. LOUIS – DENVER
MILWAUKEE & TWIN CITIES – NEW ORLEANS

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

Send for your FREE copy of the New Petroleum Book Catalog which describes the nature and contents of many books pertaining to the Petroleum Industry.

ADDRESS:

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P. O. BOX 2608
HOUSTON 1, TEXAS

TRY A CLASSIFIED AD IN PIPE LINE INDUSTRY

Idle Equipment – Idle Dollars! Sell It Through a Classified Ad in Pipe Line Industry.

QUICK ECONOMICAL RESULTFUL

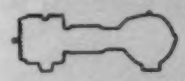
Need Engineers - Technical Personnel? A Classified Ad will get them for you.

frank wheatley

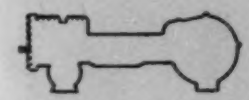
the most complete line of reciprocating power pumps for oil, salt water, mud, acid, and LPG

PUMPS

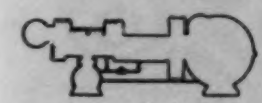
25 to 40 H.P.



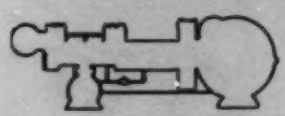
50 to 75 H.P.



75 to 125 H.P.



150 to 200 H.P.



200 to 350 H.P.

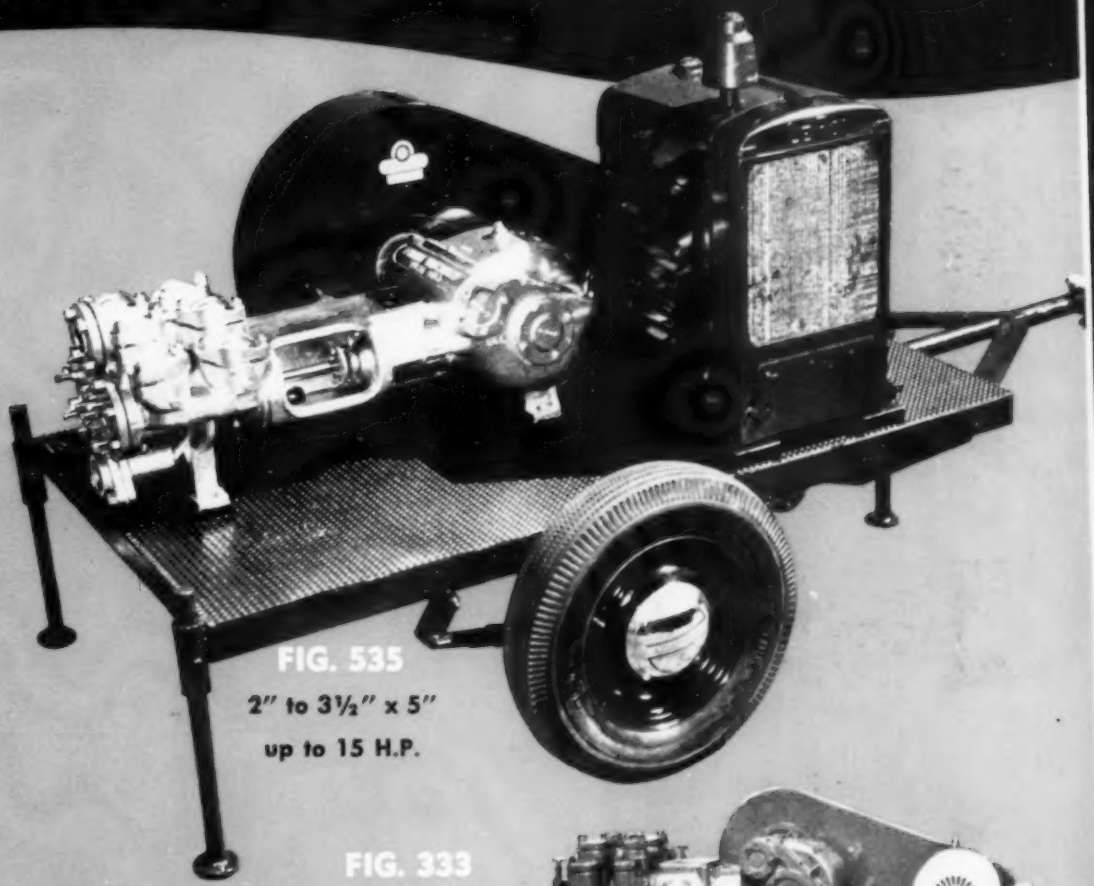


FIG. 535
2" to 3½" x 5"
up to 15 H.P.

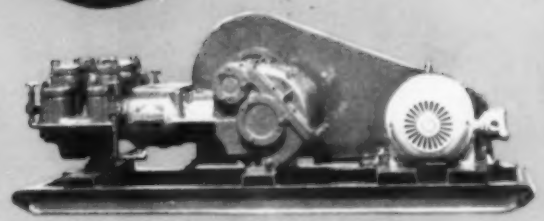


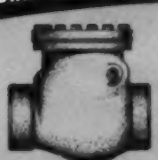
FIG. 333
1¾" to 3" x 3"
6 up to 10 H.P.

	LINER	STROKE	BPH	PSI	RPM	HP
FIG. 333	1¾	3	20	1000	125	9
	2	3	26	760	125	10
	2¼	3	34	600	125	10
	2½	3	43	480	125	10
	2¾	3	52	400	125	10
	3	3	63	340	125	10
FIG. 535	2	5	34	854	100	13
	2½	5	56	510	100	14
	3	5	83	350	100	14
	3½	5	114	260	100	14

Examine the physical appearance (above) and performance characteristics (below) of the Frank Wheatley #535 and #333 piston power pumps. They're the little units with the broad backs ready to handle your toughest assignments in small capacity, high pressure tank battery, field gathering, or salt water injection work. Popular? Just ask any of the 2000 present users! These are the "little giants" of the unequalled Frank Wheatley line . . . a line that has led the pump industry for over 40 years. More than 75 various units maintained in field-stock for immediate shipment.

The Trend is FRANK WHEATLEY completely . . .

TULSA • BARTLESVILLE • ODESSA • HOUSTON • SHREVEPORT • NEW YORK • LOS ANGELES • EDMONTON



Also . . . *"check Frank Wheatley for check valves"* . . . synthetic rubber seal full pipe opening horizontal swing check valves from 2" to 30"; 125# W.P. to 10,000# W.P. Semi-steel; steel; bronze.

FRANK WHEATLEY
PUMPS & VALVES
TULSA 6, OKLAHOMA

TO YOU FROM THE MAKERS OF GASO PUMPS

Best Wishes for the Best of Everything

During the
Christmas
Season
and in the
New Year
Beyond

GASO PUMPS
for every oil industry need

GASO PUMP & BURNER MFG. CO.
Tulsa, Oklahoma